

Ballyteige Burrow
Special Protection Area

(Site Code 4020)



Conservation Objectives
Supporting Document

VERSION 1

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SUMMARY

This document presents conservation objectives for the non-breeding Special Conservation Interests of Ballyteige Burrow Special Protection Area, designated under Directive 2009/147/EC on the conservation of wild birds (Birds Directive).

Part One presents an introduction to the Special Protection Area (SPA) designation process and to the site designated as Ballyteige Burrow Special Protection Area, as well as introducing the concept of conservation objectives and their formulation.

Part Two provides site designation information for Ballyteige Burrow SPA and Part Three presents the conservation objectives for this site.

Part Four reviews the conservation condition of the site Special Conservation Interest (SCI) species based on an analysis of wintering (non-breeding) population trends. Importantly, this section states the current conservation condition of each of the SCI species and examines these site trends in light of all-Ireland and international status and trends.

Part Five provides supporting information that will assist the interpretation of the site-specific conservation objectives. This section includes a review of the ecological characteristics of the SCI species and examines waterbird distribution recorded during the 2011/12 Waterbird Survey Programme, drawing also on data from NPWS monitoring programmes (e.g. benthic surveys) and the Irish Wetland Bird Survey (I-WeBS). Part Five concludes with information on activities and events that occur in and around Ballyteige Burrow which may interact with waterbirds during the non-breeding season and includes an assessment of activities that were recorded to cause disturbance to non-breeding waterbirds during the 2011/12 Waterbird Survey Programme.

PART ONE - INTRODUCTION

1.1 Introduction to the designation of Special Protection Areas

The over-arching framework for the conservation of wild birds within Ireland and across Europe is provided by Directive 2009/147/EC on the conservation of wild birds (the codified version of Council Directive 79/409/EEC as amended) (Birds Directive). Together with the EU Habitats Directive (Council Directive 92/43/EEC), these legislative measures provide for wild bird protection via a network of protected sites across Europe known as Natura 2000 sites, of which the overriding conservation objective is the maintenance (or restoration) of 'favourable conservation status' of habitats and species.

Under Article 4 of Directive 2009/147/EC, Ireland, along with other Member States, is required to classify the most suitable territories in number and size as Special Protection Areas (SPAs) for the conservation of certain wild bird species, which are:

- species listed in Annex I of the directive
- regularly occurring migratory species

Also under Article 4, Member States are required to pay particular attention to the protection of wetlands, especially those of international importance.

The National Parks & Wildlife Service (NPWS), part of the Department of the Arts, Heritage and the Gaeltacht, is responsible for the selection and designation of SPAs in Ireland. NPWS has developed a set of criteria, incorporating information relating to the selection of wetland sites developed under the Ramsar Convention, which are used to identify and designate SPAs. Sites that meet any of the following criteria may be selected as SPAs:

- A site regularly supporting 20,000 waterbirds or 10,000 pairs of seabirds;
- A site regularly supporting 1% or more of the all-Ireland population of an Annex I species;
- A site regularly supporting 1% or more of the biogeographical population of a migratory species;
- A site that is one of the 'n' most suitable sites in Ireland for an Annex I species or a migratory species (where 'n' is a variable which is related to the proportion of the total biogeographic population of a species held by Ireland).

The biogeographic population estimates and the recommended 1% thresholds for wildfowl and waders are taken from Wetlands International (Wetlands International, 2002); thresholds reflecting the baseline data period used. The all-Ireland populations for the majority of wintering waterbirds are taken from Crowe et al. (2008).

Site specific information relevant to the selection and designation of a SPA is collated from a range of sources including the Irish Wetland Bird Survey (I-WeBS), The Wetland Bird Survey (WeBS) in Northern Ireland, species specific reports and a wide range of scientific publications, reports and other surveys. If, following collation of all the available scientific data, a site meets the relevant criteria for designation and is selected as an SPA, a list of species for which the site is nationally and internationally important is compiled. These species are known as **Special Conservation Interests** and may be one of the following:

- An Annex I species that occurs at the site in numbers that exceed the all-Ireland 1% population threshold;
- A migratory species that occurs at the site in numbers that exceed the biogeographic 1% population threshold (referred to as a species that occurs in numbers of 'international importance');
- A migratory species that occurs at the site in numbers that exceed the all-Ireland 1% threshold (referred to as a species that occurs in numbers of 'all-Ireland importance');

- A species for which the site is considered to be one of the 'n' most suitable sites in Ireland for the conservation of that species (where n is a variable that is related to the proportion of the total biogeographic population held by Ireland).

The wetlands of northwest Europe are a vital resource for millions of northern and boreal nesting waterbird species that overwinter on these wetlands or visit them when migrating further south. To acknowledge the importance of Ireland's wetlands to wintering waterbirds the term Wetland & Waterbirds can be included as a Special Conservation Interest for a Special Protection Area that has been designated for wintering waterbirds, and is or contains a wetland site of significant importance to one or more of the species of Special Conservation Interest.

1.2 Introduction to Ballyteige Burrow Special Protection Area

Ballyteige Burrow Special Protection Area is located on the south coast of Co. Wexford between the towns of Kilmore Quay and Cullenstown. The site is dominated by a long sand and shingle barrier (spit) which supports an impressive dune complex known as the Burrow. On the seaward side is a long beach, approximately 8km in length. Behind the spit lies a shallow, tidal sea inlet and estuary of the Duncormick River (The Cull). The eastern portion of this intertidal system was reclaimed in the 19th century by construction of the Cull Bank and is now polderland (Killag), comprising mostly improved grassland and arable land. The western portion of The Cull retains semi-natural habitat including mudflats which are exposed at low tide and saltmarsh.

The site contains several coastal habitats listed on Annex I of the E.U. Habitats Directive, including saltmarshes, fixed dunes and lagoon. Consequently the site is also designated as a Special Area of Conservation (SAC 0696). Most of the site is designated a Nature Reserve.

The site is important for wintering waterbirds and provides excellent feeding grounds plus sheltered and secure high-tide roosts. The site supports non-breeding (wintering) Light-bellied Brent Goose and Black-tailed Godwit in numbers of international importance plus a further five waterbird species in numbers of all-Ireland importance. The Site Synopsis for Ballyteige Burrow SPA and a map showing the SPA boundary are given in Appendix 1.

1.3 Introduction to Conservation Objectives

The overriding objective of the Habitats Directive is to ensure that the habitats and species covered achieve '*favourable conservation status*' and that their long-term survival is secured across their entire natural range within the EU (EU Commission, 2012). In its broadest sense, favourable conservation status means that an ecological feature is being maintained in a satisfactory condition, and that this status is likely to continue into the future. Definitions as per the EU Habitats Directive are given in Box 1.

Box 1

Favourable Conservation Status as defined by Articles 1 (e) and 1(i) of the Habitats Directive

The conservation status of a natural habitat is the sum of the influences acting on it and its typical species that may affect its long-term natural distribution, structure and functions as well as the long-term survival of its typical species. The conservation status of a natural habitat will be taken as favourable when:

- *its natural range and areas it covers within that range are stable or increasing; and*
- *the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future; and*
- *the conservation status of its typical species is favourable'.*

The conservation status of a species is the sum of the influences acting on the species that may affect the long-term distribution and abundance of its populations. The conservation status will be taken as 'favourable' when:

- *the population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats; and*
- *the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future; and*
- *there is, and will probably continue to be, a sufficiently large habitat to maintain its populations*

Site-specific conservation objectives define the desired condition or range of conditions that a habitat or species should be in, in order for these selected features within the site to be judged as favourable. At site level, this state is termed 'favourable conservation condition.' Site conservation objectives also contribute to the achievement of the wider goal of biodiversity conservation at other geographic scales, and to the achievement of favourable conservation status at national level and across the Natura 2000 network¹.

Where relevant, conservation objectives are defined for attributes² relating to non-breeding waterbird species populations, and for attributes related to the maintenance and protection of habitats that support them. These attributes are:

- Population trend;
- Population distribution;
- Habitat range and area (extent).

Further guidance is given in Section 3.1 (Conservation Objectives for the Special Conservation Interests of Ballyteige Burrow Special Protection Area).

¹ Note that the terms 'conservation condition' and 'conservation status' are used to distinguish between site and the national level objectives respectively.

² Attribute can be defined as: 'a characteristic of a habitat, biotope, community or population of a species which most economically provides an indication of the condition of the interest feature to which it applies' (JNCC, 1998).

PART TWO – SITE DESIGNATION INFORMATION

2.1 Special Conservation Interests of Ballyteige Burrow Special Protection Area

The **Special Conservation Interest species**³ for Ballyteige Burrow SPA are listed below and summarised in Table 2.1. This table also shows the importance of Ballyteige Burrow SPA for its SCI species, relative to the importance of other sites within Ireland, within the South East Region, and within County Wexford.

The Special Conservation Interests listed for Ballyteige Burrow SPA are as follows:-

1. During winter the site regularly supports 1% or more of the biogeographic population of Light-bellied Brent Goose (*Branta bernicla hrota*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 290 individuals.
2. During winter the site regularly supports 1% or more of the all-Ireland population of Shelduck (*Tadorna tadorna*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 167 individuals.
3. During winter the site regularly supports 1% or more of the all-Ireland population of Golden Plover (*Pluvialis apricaria*). The mean peak number of this Annex I species within the SPA during the baseline period (1995/96 – 1999/00) was 4,630 individuals.
4. During winter the site regularly supports 1% or more of the all-Ireland population of Grey Plover (*Pluvialis squatarola*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 69 individuals.
5. During winter the site regularly supports 1% or more of the all-Ireland population of Lapwing (*Vanellus vanellus*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 7,808 individuals.
6. During winter the site regularly supports 1% or more of the biogeographic population of Black-tailed Godwit (*Limosa limosa*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 474 individuals.
7. During winter the site regularly supports 1% or more of the all-Ireland population of Bar-tailed Godwit (*Limosa lapponica*). The mean peak number of this Annex I species within the SPA during the baseline period (1995/96 – 1999/00) was 582 individuals.
8. The wetland habitats contained within Ballyteige Burrow SPA are identified of conservation importance for non-breeding (wintering) migratory waterbirds. Therefore the wetland habitats are considered to be an additional Special Conservation Interest.

³ Special Conservation Interest species are listed in taxonomic order.

Table 2.1 Site Designation Summary: species listed for Ballyteige Burrow Special Protection Area, plus site importance at national, regional and county scale

Special Conservation Interests	Annex I species	Baseline Population ^a	Population status at baseline	National Importance Rank ¹	Regional Importance Rank ²	County Importance Rank ³
Light-bellied Brent Goose (<i>Branta bernicla hrota</i>)		290	International Importance	18	5	3
Shelduck (<i>Tadorna tadorna</i>)		167	All-Ireland Importance	16	4	3
Golden Plover (<i>Pluvialis apricaria</i>)	Yes	4,630	All-Ireland Importance	12	3	2
Grey Plover (<i>Pluvialis squatarola</i>)		69	All-Ireland Importance	21	7	5
Lapwing (<i>Vanellus vanellus</i>)		7,808	All-Ireland Importance	4	2	2
Black-tailed Godwit (<i>Limosa limosa</i>)		474	International Importance	13	6	3
Bar-tailed Godwit (<i>Limosa lapponica</i>)	Yes	582	All-Ireland Importance	8	3	2
Other conservation designations associated with the site ^b	SAC	RAMSAR SITE	IMPORTANT BIRD AREA (IBA)	WILDFOWL SANCTUARY	OTHER	OTHER
	000696	Yes	Yes			pNHA Nature Reserve

^a Baseline data are the 5-year mean peak counts for the period 1995/96 – 1999/00 (I-WeBS) with the exception of Light-bellied Brent Goose (Robinson et al. 2004).

^b Note that other designations associated with Ballyteige Burrow may relate to different areas and/or some of these areas may extend outside the SPA boundary.

¹ National importance rank – the number given relates to the importance of the site for the non-breeding population of a SCI species during the baseline period (1995/96 – 1999/00) relative to other sites in Ireland.

² Regional importance rank - the number given relates to the importance of the site for the non-breeding population of a SCI species during the baseline period (1995/96 – 1999/00) relative to other sites within the South Eastern Region.

³ County importance rank - the number given relates to the importance of the site for the non-breeding population of a SCI species during the baseline period (1995/96 – 1999/00) relative to other sites within County Wexford.

PART THREE – CONSERVATION OBJECTIVES FOR BALLYTEIGE BURROW SPA

3.1 Conservation Objectives for the non-breeding Special Conservation Interests of Ballyteige Burrow SPA

The overarching Conservation Objective for Ballyteige Burrow Special Protection Area is to ensure that waterbird populations and their wetland habitats are maintained at, or restored to, favourable conservation condition. This includes, as an integral part, the need to avoid deterioration of habitats and significant disturbance; thereby ensuring the persistence of site integrity.

The site should contribute to the maintenance and improvement where necessary, of the overall favourable status of the national resource of waterbird species, and continuation of their long-term survival across their natural range.

Conservation Objectives for Ballyteige Burrow Special Protection Area, based on the principles of favourable conservation status, are described below and summarised in Table 3.1. Note that these objectives should be read and interpreted in the context of information and advice provided in additional sections of this report.

Objective 1: *To maintain the favourable conservation condition of the non-breeding waterbird Special Conservation Interest species listed for Ballyteige Burrow SPA.*

This objective is defined by the following attributes and targets:-

- To be favourable, the long term **population trend** for each waterbird Special Conservation Interest species should be stable or increasing.⁴ Waterbird populations are deemed to be unfavourable when they have declined by 25% or more, as assessed by the most recent population trend analysis.⁵
- To be favourable, there should be no significant decrease in the range, timing or intensity of use of areas by the waterbird species of Special Conservation Interest, other than that occurring from natural patterns of variation.⁶

Factors that can adversely affect the achievement of Objective 1 include:

- ❖ Habitat modification: activities that modify discrete areas or the overall habitat(s) within the SPA in terms of how one or more of the listed species use the site (e.g. as a feeding resource) could result in the displacement of these species from areas within the SPA and/or a reduction in their numbers (for further discussion on this topic please refer to Section 5.4).
- ❖ Disturbance: anthropogenic disturbance that occurs in or near the site and is either singular or cumulative in nature could result in the displacement of one or more of the listed waterbird species from areas within the SPA, and/or a reduction in their numbers (for further discussion on this topic please refer to Section 5.4).

⁴ Note that 'population' refers to site population (numbers wintering at the site) rather than the species biogeographic population.

⁵ Population trend analysis is presented in Section 4.

⁶ Waterbird distribution from the 2011/2012 waterbird survey programme is examined in Section 5.

- ❖ Ex-situ factors: several of the listed waterbird species may at times use habitats situated within the immediate hinterland of the SPA or in areas outside of the SPA but ecologically connected to it. The reliance on these habitats will vary from species to species and from site to site. Significant habitat change or increased levels of disturbance within these areas could result in the displacement of one or more of the listed waterbird species from areas within the SPA, and/or a reduction in their numbers (for further information on this topic please refer to Section 5.2).

Objective 2: *To maintain the favourable conservation condition of the wetland habitat at Ballyteige Burrow SPA as a resource for the regularly-occurring migratory waterbirds that utilise it.*

This objective is defined by the following attributes and targets:-

- To be favourable, the permanent **area** occupied by the wetland habitat should be stable and not significantly less than the area of **559 ha**, other than that occurring from natural patterns of variation.

The boundary of Ballyteige Burrow SPA was defined to include the primary wetland habitats of this site which cover an estimated **559 ha**. In addition, **102 ha** of reclaimed polderland (now categorised as terrestrial) that is immediately adjacent to the wetland site and is of importance for a range of the SCI listed species is also included in the SPA. This gives a combined SPA area of **661 ha**.

Objective 2 seeks to maintain the permanent extent of these wetland habitats, which constitute an important resource for regularly-occurring migratory waterbirds. The wetland habitats can be categorised into three broad types: subtidal; intertidal; and supratidal. Over time and through natural variation these subcomponents of the overall wetland complex may vary due to factors such as changing rates of sedimentation, erosion etc. Waterbird species may use more than one of the habitat types for different reasons (behaviours) throughout the tidal cycle.

Subtidal areas refer to those areas contained within the SPA that lie below the mean low water mark and are predominantly covered by marine water. Tidal rivers, creeks and channels are included in this category. For Ballyteige Burrow SPA this broad category is estimated to be **41 ha**. Subtidal areas are continuously available for benthic and surface feeding ducks (e.g. Wigeon) and piscivorous/other waterbirds. Various waterbirds roost in subtidal areas.

The intertidal area is defined, in this context, as the area contained between the mean high water mark and the mean low water mark. For Ballyteige Burrow SPA this is estimated to be **214 ha**. When exposed or partially exposed by the tide, intertidal habitats provide important foraging areas for many species of waterbirds, especially wading birds, as well as providing roosting/loafing⁷ areas. When the intertidal area is inundated by the tide it becomes available for benthic and surface feeding ducks and piscivorous/other waterbirds. During this tidal state this area can be used by various waterbirds as a loafing/roosting resource.

The supratidal category refers to areas that are not frequently inundated by the tide (i.e. occurring above the mean high watermark) but contain shoreline and coastal habitats and can be regarded as an integral part of the shoreline. For Ballyteige Burrow SPA this is estimated to be **304 ha**. Supratidal areas are used by a range of waterbird species as a roosting resource as well as providing feeding opportunities for some species.

⁷ Loafing can be described as any behaviour not connected with breeding or feeding, and includes preening and resting.

The maintenance of the 'quality' of wetland habitat lies outside the scope of Objective 2. However, for the species of Special Conservation Interest, the scope of Objective 1 covers the need to maintain, or improve where appropriate, the different properties of the wetland habitats contained within the SPA.

Table 3.1 Conservation Objectives for the waterbird Special Conservation Interests of Ballyteige Burrow SPA.

Objective 1:				
<i>To maintain the favourable conservation condition of the waterbird Special Conservation Interest species listed for Ballyteige Burrow SPA, which is defined by the following list of attributes and targets:</i>				
Parameter	Attribute	Measure	Target	Notes
Population	Population trend	Percentage change as per population trend assessment using waterbird count data collected through the Irish Wetland Bird Survey and other surveys.	The long term population trend should be stable or increasing	Waterbird population trends are presented in Part Four of this document.
Range	Distribution	Range, timing or intensity of use of areas used by waterbirds, as determined by regular low tide and other waterbird surveys.	There should be no significant decrease in the range, timing or intensity of use of areas by the waterbird species of Special Conservation Interest other than that occurring from natural patterns of variation.	Waterbird distribution from the 2011/12 waterbird survey programme is reviewed in Part Five of this document.
Objective 2:				
<i>To maintain the favourable conservation condition of the wetland habitat at Ballyteige Burrow SPA as a resource for the regularly-occurring migratory waterbirds that utilise it. This is defined by the following attributes and targets:</i>				
Parameter	Attribute	Measure	Target	Notes
Area	Wetland habitat	Area (ha)	The permanent area occupied by the wetland habitat should be stable and not significantly less than the area of 559 ha , other than that occurring from natural patterns of variation.	The wetland habitat area was estimated as 559 ha using OSI data and relevant orthophotographs.

PART FOUR – REVIEW OF THE CONSERVATION CONDITION OF WATERBIRD SPECIAL CONSERVATION INTERESTS

4.1 Population data for waterbird SCI species of Ballyteige Burrow SPA

Non-breeding waterbirds at Ballyteige Burrow have been counted annually as part of the Irish Wetland Bird Survey (I-WeBS) since this survey commenced in 1994/95.

Monthly count coverage has been variable but with the exception of 2000/01, Ballyteige Burrow has been counted at least once each I-WeBS season during the period September to March inclusive. This 'core' survey period covers the main wintering period when many species occur in their largest concentrations, but also the autumn and spring passage periods when total waterbird numbers may be enhanced by staging/stopover birds⁸. Light-bellied Brent Goose is also the subject of an additional species-specific survey. Further information on I-WeBS and other waterbird surveys is given in Appendix 2.

During I-WeBS the site is counted as one undivided site. The SPA area is contained within the I-WeBS count area, the latter being larger.

Table 4.1 presents population⁹ data for non-breeding waterbirds of Ballyteige Burrow. Annual maxima were identified and used to calculate the five-year mean peak for each species. The baseline period was 1995/96 – 1999/00 while the recent average relates to the five-year period 2006/07 – 2010/11. When examining waterbird data, it is standard practice to use the mean of peak counts because it reflects more accurately the importance of a site for a particular species by helping to account for inconsistencies in data gathering (i.e. differing coverage) or extraordinary fluctuations in numbers. However it is important to note that waterbird counts represent a 'snapshot' of bird numbers during a count session, so in general and taking into account all potential sources of error, resulting data are regarded to be underestimates of population size (Underhill & Prŷs-Jones, 1994).

Table 4.1 highlights where the numbers shown surpass thresholds of International or all-Ireland importance. These thresholds are different for the baseline and recent time periods used; international thresholds are outlined in Wetlands International (2002) and Wetlands International (2012), while all-Ireland thresholds are presented within Crowe et al. (2008) and Crowe & Holt (2013) for the baseline and recent site data respectively.

⁸ The terms 'stopover' and 'staging' are often used interchangeably. A stopover site can be defined as any place where a bird takes a break during migration. Staging areas can be defined as stopover sites that attract large numbers of individuals and play an important part in re-fuelling the birds before their onward migration (e.g. Warnock, 2010).

⁹ Note that 'population' refers to site population (numbers wintering at the site) rather than a species' biogeographic population.

Table 4.1 Population data for waterbird Special Conservation Interest Species of Ballyteige Burrow SPA

Site Special Conservation Interests (SCIs)	Baseline Period ¹ (1995/96 – 1999/00)	Recent Site Data ² (2006/07 – 2010/11)
Light-bellied Brent Goose	290 (i)	533 (i)
Shelduck	167 (n)	38
Golden Plover	4,630 (n)	5,186 (n)
Grey Plover	69 (n)	60 (n)
Lapwing	7,808 (n)	3,096 (n)
Black-tailed Godwit	474 (i)	247 (n)
Bar-tailed Godwit	582 (n)	172 (n)

¹Baseline data is the 5-year mean peak for the period 1995/96 – 1999/00;

²recent site data is the 5-year mean peak for the period 2006/07 – 2010/11 (I-WeBS).

(i) denotes numbers of international importance; (n) denotes numbers of all-Ireland importance.

note that thresholds differ for the baseline and recent time periods used; international thresholds are outlined in Wetlands International (2002) and Wetlands International (2012), while all-Ireland thresholds are presented within Crowe et al. (2008) and Crowe & Holt (2013) for the baseline and recent site data respectively.

4.2 Waterbird population trends for Ballyteige Burrow SPA

The calculation and assessment of waterbird population trends at Irish coastal SPA sites follows the UK Wetland Bird Survey 'Alerts System' which provides a standardised technique for monitoring changes in the numbers of non-breeding waterbirds over a range of spatial scales and time periods. A detailed methodology for this analysis is provided in Appendix 3. For Ballyteige Burrow however, the variable level of annual count coverage during I-WeBS precludes the use of this analysis. Therefore an estimation of population change over time was calculated using the 'generic threshold method' (after JNCC, 2004). This compares population size for two different five-year time periods, the change being expressed as a proportion of the initial population, as follows:

$$\text{Change} = ((I_y - I_x) / I_x) \times 100$$

where: I_y = recent population and I_x = baseline population.

This calculation was undertaken comparing the baseline population with the series of rolling peak means shown in Table 4.2. The results (% change) are shown in Table 4.3. Waterbird species codes are given in Appendix 4.

Table 4.2 Site population data for waterbird Special Conservation Interest species of Ballyteige Burrow SPA: rolling five-year means

Data period	PB	SU	GP	GV	L.	BW	BA
1995/96-1999/00 (baseline)	290 (i)	167 (n)	4,630 (n)	69 (n)	7,808 (n)	474 (i)	582 (n)
1999/00 – 2003/04*	358	129 (n)	6,268 (n)	41 (n)	5,959 (n)	353 (n)	429 (n)
2000/01-2004/05*	393 (n)	51	6,902 (n)	44 (n)	5,470 (n)	323 (n)	126
2001/02-2005/06	558 (i)	50	8,363 (i)	49 (n)	5,100 (n)	342 (n)	114
2002/03-2006/07	618 (i)	49	7,890 (i)	53 (n)	4,350 (n)	334 (n)	142
2003/04-2007/08	599 (i)	47	9,099 (i)	69 (n)	4,494 (n)	362 (n)	157 (n)
2004/05-2008/09	632 (i)	45	8,749 (i)	72 (n)	4,376 (n)	325 (n)	157 (n)
2005/06-2009/10	668 (i)	37	7,655 (i)	61 (n)	3,845 (n)	307 (n)	153 (n)
2006/07-2010/11	533 (i)	38	5,186 (n)	60 (n)	3,096 (n)	247 (n)	172 (n)

*all 5-year means except 1999/00-2003/04 and 2000/01-2004/05 which are 4-year means; data for 2000/01 missing.
(i) denotes numbers of international importance; (n) denotes numbers of all-Ireland importance.
note that thresholds differ for the baseline and recent time periods used; international thresholds are outlined in Wetlands International (2002) and Wetlands International (2012), while all-Ireland thresholds are presented within Crowe et al. (2008) and Crowe & Holt (2013) for the baseline and recent site data respectively.

Table 4.3 Site Population trends – comparison of five-year means

Data period	PB	SU	GP	GV	L.	BW	BA
Baseline vs 1999/00 – 2003/04	+ 23	- 23	+ 35	- 41	- 24	- 26	- 26
Baseline vs 2000/01-2004/05	+ 35	- 69	+ 49	- 37	- 30	- 32	- 78
Baseline vs 2001/02-2005/06	+ 92	- 70	+ 81	- 29	- 35	- 28	- 80
Baseline vs 2002/03-2006/07	+ 113	- 70	+ 70	- 24	- 44	- 29	- 76
Baseline vs 2003/04-2007/08	+ 106	- 72	+ 97	- 1	- 42	- 24	- 73
Baseline vs 2004/05-2008/09	+ 118	- 73	+ 89	+ 4	- 44	- 31	- 73
Baseline vs 2005/06-2009/10	+ 130	- 78	+ 65	- 12	- 51	- 35	- 74
Baseline vs 2006/07-2010/11	+ 84	- 77	+ 12	- 12	- 60	- 48	- 70

Light-bellied Brent Goose – there has been a consistent trend for increasing numbers at Ballyteige Burrow. This is in line with the national trend where numbers increased at an annual rate of 5.1% over the period 1994/95 to 2008/09 (Boland & Crowe, 2012), while the all-Ireland trend is for a mean annual increase of 1.6% over the period 1999-2010 (Crowe & Holt, 2013).

Shelduck – numbers of this species have dropped significantly since the baseline data period with no site count since the 1999/00 season reaching the threshold for all-Ireland importance. Numbers have shown a slight but steady decline since the mid 1990's at national level (Boland & Crowe, 2012) while the all-Ireland trend is stable (Crowe & Holt, 2013).

Golden Plover – numbers of this wader species can be highly variable between years. In some cases this is in response to weather patterns, with reduced numbers in cold winters as evidenced at national level (e.g. Crowe et al. 2012) and at Ballyteige Burrow in the winters 2009/10 and 2010/11. The national trend is for largely stable numbers since the mid 1990's

(Boland & Crowe, 2012) while numbers at the all-Ireland scale have declined during the period 1999-2010 (Crowe & Holt, 2013).

Grey Plover – numbers of this wader species can be highly variable between years, sometimes halving or doubling between successive seasons. At national and all-Ireland scale this species has shown a progressive decline in numbers across the long-term (Boland & Crowe, 2012; Crowe & Holt, 2013).

Lapwing – site numbers were much reduced in the seasons 2009/10 and 2010/11 likely in response to the cold winters, a pattern also evidenced at national level (e.g. Crowe et al. 2012). The trend for decline at site level is consistent with both the long-term national and all-Ireland trends.

Black-tailed Godwit – this species has experienced an almost progressive decline in numbers at Ballyteige Burrow. This contrasts to the national and all-Ireland trends, where this wader has exhibited increasing numbers throughout I-WeBS; a pattern also evidenced in the UK (Holt et al. 2012).

Bar-tailed Godwit – the overall long-term trend for decline at this site reflects the relatively high numbers that were recorded during the baseline period; such numbers not recorded at the site in any season since. From 2001/02 onwards, numbers have been largely stable with some short-term increase in numbers. Nationally and at all-Ireland scale, numbers have remained broadly stable throughout I-WeBS, while a decline has been evident in Britain since the early 2000's with some recovery in recent seasons (Boland & Crowe, 2012; Crowe & Holt, 2013; Holt et al. 2012).

4.3 Ballyteige Burrow SPA – site conservation condition of waterbird SCI species

Conservation condition of SCI species was determined using a species site trend based on the comparison of the baseline peak mean with the most recent peak mean, and therefore relates to Conservation Objective 1 (population trend) only¹⁰. Conservation condition is assigned using the following criteria:

Favourable population = population is stable/increasing.

Intermediate (unfavourable) = Population decline in the range 1.0 – 24.9%.

Unfavourable population = populations that have declined between 25.0 – 49.9% from the baseline reference value.

Highly Unfavourable population = populations that have declined > 50.0% from the baseline reference value.

The threshold levels of >25.0% and >50.0% follows standard convention used for waterbirds (e.g. Lynas et al. 2007; Leech et al. 2002). The 'Intermediate' range (1.0% - 24.9% decline) allows for natural fluctuations and represents a range within which relatively small population declines have the potential to be reversible and less likely to influence conservation status in the long-term (Leech et al. 2002). Declines of more than 25.0% are deemed of greater ecological significance for the long-term.

¹⁰ Conservation condition in relation to Objective 1 (range, timing or intensity of use of areas by SCI species) has yet to be assigned.

With regards the seven waterbird species of Special Conservation Interest listed for Ballyteige Burrow SPA, it has been determined that (Table 4.4):-

1. 3 species is currently considered as **Highly Unfavourable** (Shelduck, Lapwing, & Bar-tailed Godwit);
2. 1 species is currently considered as **Unfavourable** (Black-tailed Godwit);
3. 1 species are currently considered as **Intermediate Unfavourable** (Grey Plover);
4. 2 species are currently considered as **Favourable** (Light-bellied Brent Goose & Golden Plover).

Site conservation condition and population trends were also reviewed in light of species' all-Ireland and international trends (Table 4.4). All-Ireland trends follow Crowe & Holt (2013) while International trends follow Wetlands International (2012).

Table 4.4 SCI species of Ballyteige Burrow SPA – Current Site Conservation Condition

Special Conservation Interests	BoCCI Category ^a	Site Population Trend ^b	Site Conservation Condition	Current All-Ireland Trend ^c	Current International Trend ^d
Light-bellied Brent Goose	Amber	+ 84	Favourable	Increasing	Increasing
Shelduck	Amber	- 77	Highly Unfavourable	Stable	Stable
Golden Plover	Red	+ 12	Favourable	Declining	Decreasing
Grey Plover	Amber	- 12	Intermediate (unfavourable)	Declining	Decreasing?
Lapwing	Red	- 60	Highly Unfavourable	Declining	Stable
Black-tailed Godwit	Amber	- 48	Unfavourable	Increasing	Increasing
Bar-tailed Godwit	Amber	- 70	Highly Unfavourable	Stable	Increasing

^aAfter Colhoun & Cummins, 2013; ^b Site population trend analysis; see Table 4.3; ^call-Ireland trend - where a species is deemed to be increasing or declining if the annual rate of change is equal to or greater than 1.2% (after Crowe & Holt, 2013); ^d current international trend after Wetlands International (2012).

Table 4.4 also shows the relationship between a species' long-term site trend and the current all-Ireland trend for the period 1999/00 to 2010/11. The colour coding used represents the following cases:-

- **Green** – species whose populations are stable or increasing at both site level and all-Ireland level.
- **Beige** – species whose populations are declining at both site level and all-Ireland level. Therefore there is a potential for factors at a larger spatial scale to be influencing the observed trend at site level.
- **Orange** - species whose populations are exhibiting a 1.0 – 24.9% decline at site level but are stable or increasing at all-Ireland level.
- **Pink** - species whose populations are exhibiting a 25.0 – 49.9% decline at site level but are stable or increasing at all-Ireland level.
- **Red** - species whose populations are exhibiting a decline of >50.0% at site level but are stable or increasing at all-Ireland level.

The pink and red categories highlight where populations are stable at all-Ireland level, but where significant declines are seen at site level. In these cases it would be reasonable to suggest that site-based management issues may be responsible for the observed declining site population trends (Leech et al. 2002).

PART FIVE – SUPPORTING INFORMATION

5.1 Introduction

Part Five of this report is based around the need to review, collate and disseminate site-specific information relating to the Special Conservation Interests of Ballyteige Burrow SPA.

Section 5.2 provides selected ecological summary information for non-breeding waterbirds of Ballyteige Burrow. Section 5.3 presents results from the 2011/12 Waterbird Survey Programme. Finally, Section 5.4 provides summary information on activities and events that occur in and around Ballyteige Burrow that may either act upon the habitats within the site, or may interact with waterbirds using the site.

The information provided is intended to:-

- assist the interpretation and understanding of the site-specific conservation objectives;
- facilitate the identification of conservation priorities and direct site management measures;
- inform the scope and nature of Appropriate Assessments in applying the provisions of Article 6 of the Habitats Directive.

Note however, that the information does not aim to provide a comprehensive assessment on which to assess plans and projects as required under the Habitats Directive, but rather should inform the scope of these assessments and help direct where further detailed examinations are required. The information presented in this report was compiled in May 2013 and updated in January 2014.

5.2 Waterbird species – Ecological characteristics, requirements and specialities – summary information

Waterbirds, defined as ‘birds that are ecologically dependent on wetlands’ (Ramsar Convention, 1971), are a diverse group that includes divers, grebes, swans, geese and ducks, gulls, terns and wading birds. During the data period 1994/95 – 2010/11 the I-WeBS database shows a total of 46 waterbird species that have been recorded across the survey area of Ballyteige Burrow. These species represent eleven waterbird families: *Gaviidae* (divers), *Podicipedidae* (grebes), *Anatidae* (swans, geese and ducks), *Rallidae* (Water Rail, Moorhen & Coot), *Haematopodidae* (oystercatchers), *Charadriidae* (plovers and lapwings), *Scolopacidae* (sandpipers and allies) and *Laridae* (gulls and terns) plus *Phalacrocoracidae* (Cormorants), *Ardeidae* (Hérons) and *Alcedinidae* (Kingfisher).

As described in Section 1.1, the wetland habitats contained within this SPA are considered to be a Special Conservation Interest in their own right. The wetland habitat is an important resource for listed SCI species and for other waterbird species included in the total waterbird assemblage. These species may include those that utilise the site during passage, those that are present in months of the year outside of the non-breeding season¹¹ or species that use the site at certain times only (e.g. as a cold weather refuge).

18 waterbird species occurred on a regular basis at Ballyteige Burrow during the period 1994/95 to 2010/11.¹² Excluding the SCI species, a further 11 regularly-occurring species are listed in Table 5.1. Note that gulls were not included as they were not counted regularly.

¹¹ Non-breeding season is defined as September – March inclusive.

¹² Regular is defined as a species that has occurred in 12 out of the 16-year data period (data for 2000/01 missing).

Table 5.1 Regularly-occurring non SCI waterbird species that occur at Ballyteige Burrow during the non-breeding season

Species	Baseline Data Period ¹ (1995/96 – 1999/00)	Recent Site Average ² (2006/07 – 2010/11)
Mute Swan (<i>Cygnus olor</i>)	18	16
Wigeon (<i>Anas penelope</i>)	306	266
Teal (<i>Anas crecca</i>)	142	200
Red-breasted Merganser (<i>Mergus serrator</i>)	24	14
Cormorant (<i>Phalacrocorax carbo</i>)	10	18
Grey Heron (<i>Ardea cinerea</i>)	3	5
Little Egret (<i>Egretta garzetta</i>)	1	23 (n)
Oystercatcher (<i>Haematopus ostralegus</i>)	109	81
Dunlin (<i>Calidris alpina</i>)	1,020	349
Curlew (<i>Numenius arquata</i>)	476	279 (n)
Redshank (<i>Tringa totanus</i>)	206	299**

Grey shading denotes an Annex I species; (n) denotes numbers of all-Ireland importance (after Crowe & Holt, 2013).

¹ Baseline data is the 5-year mean peak for the period 1995/96 – 1999/00 (I-WeBS); ² recent site data is the 5-year mean peak for the period 2006/07 – 2010/11 (I-WeBS).

**Very close to the all-Ireland 1% threshold of 300 individuals.

In addition to regularly-occurring waterbirds, the Annex I species Bewick's Swan and Whooper Swan have been recorded foraging in agricultural habitats that are adjacent to the wetland habitat of Ballyteige. While the numbers attending these fields are both variable in terms of abundance and irregular in frequency, it is understood that these feeding flocks forage over the wider terrestrial areas and are part of the migratory swan populations that are listed at Wexford Harbour and Slobs SPA and Tachumshin Lake SPA due to the fact that these are known roost sites for these species.

Although waterbirds may be linked by their dependence on water, different species vary considerably in aspects of their ecology due to many evolutionary adaptations and specialisations to their wetland habitats. Different species or groups of species may therefore utilise wetland habitats in very different ways which relates to how species are distributed across a site as a whole. Table 5.2 provides selected ecological information for the waterbird SCI species of Ballyteige Burrow SPA. Information is provided for the following categories¹³:-

- waterbird family (group);
- winter distribution – species distribution range during winter (based on the period 2001/02 – 2008/09 (after Boland & Crowe, 2012));
- trophic (foraging) guild (after Weller, 1999; see Appendix 5);
- food/prey requirements;
- principal supporting habitat within the site;
- ability to utilise other/alternative habitat in/around the site;
- site fidelity (species 'faithfulness' to wintering sites).

It should be borne in mind that a single wetland site is unlikely to meet all of the ecological requirements of a diverse assemblage of waterbirds (Ma et al. 2010). Although some waterbird species will be faithful to specific habitats within the SPA, many will at times also use habitats situated within the immediate hinterland of the site or in areas ecologically connected to the SPA. These areas may be used as alternative high tide roosts, as a foraging resource or, be simply flown over, either on migration or on a more frequent basis throughout the non-breeding season as waterbirds move between different areas used (e.g. commuting corridors between feeding and roosting areas).

Reliance on alternative habitats will vary between species and from site to site. Use of alternative habitats is also likely to vary through time, from seasonally through to daily, and different habitats may be used by day and night (Shepherd et al. 2003). Different waterbirds

¹³ Notes to aid the understanding of categories and codes used in Table 5.2 are provided in the table sub text.

may utilise wetland habitats in different ways. For example, while the majority of wading birds forage across exposed tidal flats, species such as Lapwing and Golden Plover are considered to be 'terrestrial waders,' typically foraging across grassland and using tidal flats primarily for roosting. When tidal flats are covered at high water, intertidally-foraging waterbirds are excluded and many will move to nearby fields to feed. Terrestrial foraging is also important when environmental factors (e.g. low temperature) reduce the profitability of intertidal foraging (e.g. Zwarts & Wanink, 1993). Some waterbird species are simply generalists, and make use of a range of habitats, for example the Black-tailed Godwit that forages across intertidal mudflats and grassland habitats. Other waterbird species such as Greenland White-fronted Goose or Bewick's Swan are herbivores and are therefore reliant on terrestrial areas, often outside of the SPA boundary, and use the wetland site primarily for roosting. Some species switch their habitat preference as food supplies become depleted; an example being Light-bellied Brent Geese that exploit grasslands increasingly when intertidal seagrass and algae become depleted.

The topic of alternative habitat use is also applicable to benthic-foraging seaducks and divers whose foraging distribution is highly influenced by water depth and tidal conditions. Many of these species however (e.g. Great Northern Diver, Common Scoter) exhibit a widespread coastal distribution during winter utilising shallow nearshore waters to a greater degree at certain times (e.g. storms, driving onshore winds).

Thus the area designated as a SPA can represent a variable portion of the overall range of the listed waterbird species. To this end, data on waterbird use of areas adjacent to or ecologically connected to the SPA are often collected. Indeed for some species a mix of site-related and wider countryside measures are needed to ensure their effective conservation management (Kushlan, 2006). Furthermore, it is recommended that assessments that are examining factors that have the potential to affect the achievement of the site's conservation objectives should also consider the use of these '*ex-situ*' habitats, and their significance to the listed bird species.

Table 5.2 Waterbirds – Ecological characteristics, requirements & specialities

Special Conservation Interests	Family (group)	Winter distribution ^A	Trophic Guild ^B	Food/Prey Requirements ^C	Principal supporting habitat within site ^D	Ability to utilise other/alternative habitats ^E	Site Fidelity ^F
Light-bellied Brent Goose <i>Branta bernicla hrota</i>	Anatidae (geese)	Localised	1, 5	Highly specialised	Intertidal mud and sand flats	2	High
Shelduck <i>Tadorna tadorna</i>	Anatidae (shelducks)	Localised	1, 5	Wide	Intertidal mud and sand flats, shallow subtidal	3	High
Golden Plover <i>Pluvialis apricaria</i>	Charadriidae (wading birds)	Intermediate	4	Wide	Intertidal mud and sand flats	2	Moderate
Grey Plover <i>Pluvialis squatarola</i>	Charadriidae (wading birds)	Localised	4	Wide	Intertidal mud and sand flats	3	High
Lapwing <i>Vanellus vanellus</i>	Charadriidae (wading birds)	Widespread	4	Wide	Intertidal mud and sand flats	2	Moderate
Black-tailed Godwit <i>Limosa limosa</i>	Scolopacidae (wading birds)	Localised	4	Wide	Intertidal mud and sand flats	2	High
Bar-tailed Godwit <i>Limosa lapponica</i>	Scolopacidae (wading birds)	Localised	4	Wide	Intertidal mud and sand flats	3	Moderate

^A Winter distribution: Very widespread (>300 sites); Widespread (200 – 300 sites); Intermediate (100 – 200 sites); Localised (50-100 sites); Highly restricted (<50 sites) (based on Boland & Crowe, 2012).

^B Waterbird foraging guilds. 1 = Surface swimmer, 2 = water column diver (shallow), 3 = water column diver (deeper), 4/5 = intertidal walker (out of water), 6 = intertidal walker (in water), 7 = terrestrial walker. Further details are given within Appendix 5.

^C Food/prey requirements - species with a wide prey/food range; species with a narrower prey range (e.g. species that forage upon a few species/taxa only), and species with highly specialised foraging requirements (e.g. piscivores).

^D Principal supporting habitat present within Ballyteige Burrow. Note that this is the main habitat used when foraging with the exception of Golden Plover and Lapwing which relates to roosting habitat.

^E Ability to utilise alternative habitats refers to the species ability to utilise other habitats adjacent to the site. 1 = wide-ranging species with requirement to utilise the site as and when required; 2 = reliant on site but highly likely to utilise alternative habitats at certain times (e.g. high tide); 3 = considered totally reliant on wetland habitats due to unsuitable surrounding habitats and/or species limited habitat requirements.

^F Site fidelity on non-breeding grounds: Unknown; Weak; Moderate; or High (based on published literature).

5.3 The 2011/12 waterbird survey programme

5.3.1 Introduction

The waterbird survey programme was designed to investigate how waterbirds are distributed across coastal wetland sites during the low tide period. The surveys ran alongside and are complementary to the Irish Wetland Bird Survey (I-WeBS) which is a nationwide survey undertaken primarily on a rising tide or at high tide.

In 2011/12, a standard survey programme of four low tide counts and one high tide count was undertaken at Ballyteige Burrow¹⁴. Waterbirds were counted within a series of 14 count subsites. These subsites covered the SPA area and additional areas of agricultural grassland known to be used by foraging geese. The SPA area and count area are not coincident so from here on in this report the site 'Ballyteige Burrow' refers to the count area and not the SPA area. Further survey details are provided in Cummins & Crowe (2012) and a list and map of subsites are provided in Appendix 6.

The behaviour of waterbirds during counts was attributed to one of two categories (foraging or roosting/other) while the position of birds was recorded in relation to one of four broad habitat types (Table 5.3). Note that these broad habitats were defined specifically for the survey programme and do not follow strict habitat-based definitions for these areas, nor follow definitions used in relation to conservation objectives outlined in Section 3.1. For a detailed survey methodology, please refer to NPWS (2011).

Table 5.3 Definition of broad habitat types used

Broad Habitat Type	Broad Habitat Description
Intertidal (area between mean high water and mean low water)	Refers to the area uncovered by the tide and most likely dominated by mudflats and sandflats. It may also include areas of rocky shoreline, areas of mixed sediment and grave/pebbles or shingle and gravel shores.
Subtidal (area that lies below mean low water)	Refers to areas that are covered by seawater during counts. During low-tide counts it will include offshore water, tidal channels and creeks as well as tidal rivers.
Supratidal	This category pertains to the shore area and habitats immediately marginal to and above the mean high-water mark. The supratidal section is an integral part of the shoreline. This broad habitat also includes areas of saltmarsh where the saltmarsh is contiguous with coastal habitats lying above. Note that patches of lower saltmarsh (e.g. <i>Spartina</i> sp.) surrounded by intertidal flats, were included in the intertidal category.
Terrestrial	Used where birds were recorded within habitats close to the shoreline but were above the intertidal and supratidal levels. Polderland.

In addition to the main survey programme described above, two high tide roost surveys were undertaken on 18th November 2011 and 13th February 2012. During these surveys waterbird roost sites were located, species and numbers of waterbirds counted and the position of roosts marked onto field maps.

5.3.2 Waterbird data, analyses and presentation

The aim of data analyses was to understand how waterbirds are distributed across the site of Ballyteige Burrow during the autumn and winter months. By assessing patterns of waterbird distribution at low and high tide, together with examination of data on sediment and invertebrate distribution and abundance, we aimed to identify areas (subsites) within the site that are the most important for foraging and roosting on a species by species basis.

¹⁴ Low tide surveys on 11/10/11, 12/11/11, 09/12/11 & 08/02/12 plus one high tide survey on 16/01/12.

Data analyses were undertaken to determine the proportional use of subsites by each Special Conservation Interest (SCI) species, relative to the whole area surveyed on each survey occasion. Analyses were undertaken on datasets as follows:

- Total numbers (low tide surveys);
- Total numbers (high tide survey);
- Total numbers of foraging birds (low tide surveys);
- Total numbers of roosting birds (low tide and high tide surveys).

For each of the analyses listed above and for each survey date where full subsite coverage was achieved, the subsites were ranked in succession from the highest to the lowest in terms of their relative contribution to each species' distribution across all subsites surveyed. Rank positions were then converted to categories (see below) with the exception of those relating to the single high tide survey that are presented simply as rank numbers. The highest rank position/category for each subsite across any of the low tide count dates is presented in a subsite by species matrix.

Subsite Rank Position - Categories

Very High (V)	Any section ranked as 1.
High (H)	Top third of ranking placings (where n = total number of count sections species was observed in)
Moderate (M)	Mid third of ranking placings (where n = total number of count sections species was observed in)
Low (L)	Lower third of ranking placings (where n = total number of count sections species was observed in).

Intertidal foraging density was calculated for selected species and for each low tide survey occasion, by dividing the number of the species within a subsite by the area of intertidal habitat within the same subsite. Subsites were ranked based on the peak foraging density recorded. Whole site intertidal foraging density was calculated by summing the mean subsite counts for each species and dividing by the total area of intertidal habitat.

Waterbird count data for low tide surveys are also presented as species distribution maps ('dot density maps'). Dot-density maps show waterbird species distribution within intertidal, subtidal or terrestrial habitat¹⁵ divided into 'foraging' birds and 'roosting/other' birds. These maps show the number of birds represented by dots; each dot representing one, or a pre-determined number of birds. As the dots are placed in the appropriate subsites and broad habitat types for the birds counted, the resulting map is equivalent to presenting numbers and densities and provides a relatively quick way of assessing species distribution.

In contrast to dot-density maps, roost maps produced from roost survey data show the mapped locations of waterbird roosts, but note the limitations in relation to field mapping discussed below.

Notes on data interpretation and methodological limitations

Subsite rankings and dot-density maps relate to the distribution of waterbirds during complete surveys only. Care must be taken in the interpretation of these data, and subsite rankings in isolation should not be used to infer a higher level of conservation importance to one area over another without a detailed examination of data and understanding of each species' ecology. For instance, while some species are known to be highly site-faithful, both at site

¹⁵ Note that birds within supratidal habitat are not included within these maps.

level and within-site level (e.g. Dunlin), other species may range more widely across a site(s). While some species by their nature may aggregate in high numbers, other species such as Greenshank or Grey Heron may not. It is also important to consider that distribution maps and data refer to a single season of low tide surveys. Although important patterns of distribution will emerge, these distributions should not be considered absolute; waterbirds by their nature are highly mobile and various factors including tide (e.g. spring/neap), temperature, direction of prevailing winds, changing prey densities/availabilities and degree of human activity across the site, could lead to patterns that may change in different months and years.

Dot-density maps are not intended to show the actual position of each bird; the dots are placed randomly within subsites so no conclusions can be made at a scale finer than subsite. Dots are placed in the appropriate subsites and broad habitat types for the birds counted but given that the broad habitats are based on OS mapping, there are various cases where the mapping does not accurately portray where a bird was e.g. in the case of birds associated with freshwater flows, or small creeks that are not shown on OS maps. These associations are discussed as necessary in the individual species text tables.

The mapping of flock positions or roost locations over large distances in intertidal habitats (i.e. mapping by eye) is inherently difficult and prone to error. Flock or roost positions should therefore be viewed as indicative only.

5.3.3 Summary Results

A total of 39 waterbird species were recorded at Ballyteige Burrow during the 2011/12 survey programme. Cummins and Crowe (2012) provide a summary of waterbird data collected. Note that the total survey area and the SPA area are different; the count area being considerably larger. A map showing count subsites is provided in Appendix 6.

All SCI species were recorded within all counts of the main survey programme. Table 5.4 shows peak numbers (whole site) for SCI species recorded during the low tide (LT) and high tide (HT) surveys.

Average subsite occupancy, the average proportion of subsites in which a species occurred was relatively low for all SCI species; the maximum average being just 32% of subsites (Bar-tailed Godwit). Four of the seven SCI species occurred, on average, in a quarter or less of the count subsites.

Average percentage area occupancy is defined as the average proportion of the whole survey area that a species occurred in during low tide counts. Although this is a broad calculation across all habitat zones it presents some indication of the range of a species across the survey area as a whole. This area was again low for all SCI species with the highest average percentage area occupancy being recorded for Lapwing (17%); the lowest was Shelduck (5%). When this calculation was repeated for intertidal habitat only (Table 5.4 Column 5), the % area occupancy increased for all species with five of the species occurring, on average in more than 30% of the intertidal habitat that occurred in subsites.

Table 5.4 Ballyteige Burrow 2011/12 waterbird surveys – summary data

Site Special Conservation Interests (SCIs)	1. Peak number - LT surveys ⁱ	2. Peak number - HT survey ⁱⁱ	3. Average subsite % occupancy ⁱⁱⁱ	4. Average % area occupancy ⁱⁱⁱ	5. Average % intertidal occupancy ⁱⁱⁱ
Light-bellied Brent Goose	1,079 (i)	307	27 (12)	11 (4)	30 (19)
Shelduck	37	27	11 (4)	5 (4)	11 (7)
Golden Plover	5,720 (n)	737	14 (6)	9 (11)	15 (11)
Grey Plover	103 (n)	127 (n)	25 (14)	9 (6)	34 (21)
Lapwing	5,226 (n)	3,421 (n)	32 (17)	17 (13)	38 (24)
Black-tailed Godwit	356 (n)	166	25 (12)	16 (14)	30 (17)
Bar-tailed Godwit	112	217 (n)	34 (9)	13 (3)	48 (8)

ⁱ 4 low-tide counts undertaken on 11/10/11, 12/11/11, 09/12/11 & 08/02/12; ⁱⁱ High-tide count undertaken on 16/01/12;

ⁱⁱⁱ Mean (\pm s.d.) averaged across the complete low tide surveys that the species occurred in.

(i) denotes numbers of international importance (after Wetlands International, 2012; (n) denotes numbers of all-Ireland importance (after Crowe & Holt, 2013).

Whole site species richness (total number of species) ranged from 25 species (October 2011) to 32 species (December 2011) and 30 species were recorded during the high tide survey on 16/01/12.

During low tide surveys, average subsite species richness ranged from one species (largely terrestrial subsites 0O601, 0O602, 0OL02 and 0OL10) to a peak mean of 18 species recorded for 0OL06 (Blackstone) (Table 5.5). Of the nine intertidal/subtidal subsites, six supported on average ten or more species during low tide surveys. While the five terrestrial subsites (0O601, 0O602, 0OL10, 0OL11, 0OL12) recorded the lowest number of species during low tide surveys, three of these recorded a greater number of species during the high tide survey.

Table 5.5 Subsite species richness

Subsite Code	Subsite name	Mean (\pm S.D) LT SurveyS*	HT Survey**	Peak Overall (H/L)
0O601	Blackstone fields & racetrack	1 (1)	2	2 (H)
0O602	Duncormick Hill	1 (1)	6	6 (H)
0OL02	Duncormick Marsh	1 (1)	9	9 (H)
0OL03	Seafield	16 (2)	18	18 (L/H)
0OL04	Lacken	16 (1)	10	16 (L)
0OL05	Cullenstown	14 (3)	16	18 (L)
0OL06	Blackstone	18 (8)	13	28 (L)
0OL07	Cull Island	10 (2)	13	13 (H)
0OL08	The Cull	15 (3)	9	18 (L)
0OL09	Ballyteige	2 (2)	3	4 (L)
0OL10	Ballyharty Fields	1 (2)	1	4 (L)
0OL11	Killag Fields	3 (3)	6	8 (L)
0OL12	Inish & Ballyteige Slob	2 (1)	4	4 (H)
0OL13	Ballymadder beach	4 (3)	5	8 (L)

*averaged across low-tide counts undertaken on 11/10/11, 12/11/11, 09/12/11 & 08/02/12;

** High tide count undertaken on 16/02/12.

5.3.4 Waterbird distribution

Data analyses determined the proportional use of subsites by each Special Conservation Interest (SCI) species, relative to the site as a whole during both low tide and high tide surveys. Selected results from these 'subsite assessments' are shown in Tables 5.6 (a–f).

The relative importance of each subsite is based on the final rank positions (see 5.3.2 for methodology). Where boxes are left blank, it simply means that a species was not recorded in that subsite.

Ranked assessments relate to the broad habitat that birds were observed in. In some cases, data for different broad habitats have been combined, for example, in the case of wading birds and intertidal/subtidal habitat which were combined in order to include those individuals that had their feet in water and were recorded as subtidal.

The fact that different subsites may be ranked as 'Very High' for the same species highlights the fact that several subsites may be equally important for the species being analysed. This approach, rather than averaging across all surveys, allows for equal weightings to be given for temporal differences – e.g. concentrations of foraging birds in different subsites at different times reflecting the natural pattern of distribution across time as species move in response to changing prey densities or availabilities.

Tables 5.6 (a–f) are followed by species discussion notes which provide additional information on the distribution of each SCI species, drawing upon the full extent of the data collected and analysed for Ballyteige Burrow. Waterbird distribution dot-density maps are provided in Appendix 7; summary roost data are presented in Appendix 8.

Table 5.6 (a) Ballyteige Burrow Subsite assessment – total numbers during LT surveys (across all behaviours and habitats) (L Low, M Moderate; H High V Very high; please see Section 5.3.2 for methods).

Species ►	PB	SU	GP	GV	L.	BW	BA
Subsites							
0O601						V	
0O602	V						
0OL02							
0OL03	H	V	V	V	V	V	V
0OL04	M			M	M	M	H
0OL05	V				M		
0OL06	V	H	M	V	H	M	V
0OL07	H		V	V	V	H	V
0OL08	L	V	V	V	V	M	V
0OL09							
0OL10						H	
0OL11			H		M	M	
0OL12		H					
0OL13	L						

Table 5.6 (b) Ballyteige Burrow Subsite assessment – ranked total numbers HT Survey (across all broad habitats)

Species ►	PB	SU	GP	GV	L.	BW	BA
Subsites							
0O601					4		
0O602			3		1	1	
0OL02		3			11		
0OL03	1			1	5		3
0OL04	5				10	2	4
0OL05	4		4	5	6		
0OL06	2			3	9	3	
0OL07		2	1	2	2		1
0OL08	3	1		4	8		2
0OL09							
0OL10							
0OL11					7		
0OL12			2		3		
0OL13							

Table 5.6 (c) Ballyteige Burrow Subsite assessment – total numbers foraging intertidally^I and subtidally^{II} (L Low, M Moderate; H High V Very high; please see Section 5.3.2 for methods)

Species ►	PB ^I	PB ^{II}	SU ^I	SU ^{II}	GP ^I	GV ^I	L ^I	BW ^I	BA ^I
Subsites									
0O601									
0O602									
0OL02									
0OL03	M				H	V		V	V
0OL04						M		V	M
0OL05	V	V					V		L
0OL06	V	H				V	V	M	V
0OL07					V	V	H	H	V
0OL08	L		V	V		V		H	V
0OL09									
0OL10									
0OL11									
0OL12									
0OL13	V	H							

Table 5.6 (d) Ballyteige Burrow Subsite assessment – ranked peak intertidal foraging densities for selected species - LT surveys.

Species ►	GV	BW	BA
Subsites			
0OL03	3	1	2
0OL04	5	5	5
0OL05			6
0OL06	2	3	4
0OL07	1	4	3
0OL08	4	2	1
0OL09			

Table 5.6 (e) Ballyteige Burrow Subsite assessment – total numbers (roosting/other behaviour) during LT surveys (Intertidal^I and subtidal^{II}) Low, M Moderate; H High V Very high; please see Section 5.3.2 for methods).

Species ▶	PB ^I	PB ^{II}	SU ^I	SU ^{II}	GP ^I	GV ^I	L ^I	BW ^I	BA ^I
Subsites ▼									
0O601									
0O602									
0OL02									
0OL03		V		V	V	V	V	V	V
0OL04	V	V				V	M	V	V
0OL05		V					M		
0OL06			V		M		H	H	
0OL07	V	V			V	H	V		V
0OL08			V		V		V		
0OL09									
0OL10									
0OL11									
0OL12									
0OL13									

Table 5.6 (f) Ballyteige Burrow Subsite assessment – ranked total numbers (roosting/other behaviour) during HT survey (Intertidal^I, Subtidal^{II})

Species ▶	PB ^{II}	SU ^{II}	GP	GV ^I	L ^I	BW	BA ^I	
Subsites ▼								
0O601			<i>not recorded</i>			<i>not recorded</i>		
0O602								
0OL02								
0OL03	1	1			2		1	1
0OL04								
0OL05								
0OL06								
0OL07					1			
0OL08								
0OL09								
0OL10								
0OL11								
0OL12								
0OL13								

Ballyteige Burrow - Waterbird Survey Programme 2011/12

Waterbird distribution - discussion notes

Where mentioned, information on benthic communities or sediment is from the intertidal and subtidal sampling programme commissioned by the National Parks & Wildlife Service (NPWS) and Marine Institute and reported in NPWS (2014) and Merc Consultants/ERM (2012).

'I-WeBS' refers to count data recorded at Ballyteige Burrow as part of the Irish Wetland Bird Survey.

Light-bellied Brent Goose *Branta bernicla hrota* - Family (group): Anatidae (geese)

Migratory Light-bellied Brent Geese (hereafter called 'Brent Geese') that spend winter within Ireland belong to the East Canadian High Arctic population. Almost all of this population spends winter within Ireland.

Brent Geese begin to arrive in Ireland in late August when almost three-quarters of the biogeographic population congregate at Strangford Lough in Northern Ireland before dispersing to other sites (Robinson et al. 2004).

Numbers

Low tide numbers ranged from 30 (11/10/11) to a peak site count of 1,079 Brent Geese on 08/02/12. 307 Brent Geese were recorded during the high tide survey. The December 2011 and February 2012 low tide survey counts exceeded the threshold of international importance.

Brent Geese were recorded in eight subsites across the survey period (00602, 00L03, 00L04, 00L05, 00L06, 00L07, 00L08 and 00L13). Only one subsite recorded the species in all surveys (00L05 (Cullenstown)) and it held peak numbers on two occasions (11/10/11 and 12/11/11). Peak numbers were also held by 00L06 (Blackstone) (09/12/11) and 00602 (Duncormick Hill) (08/02/12); the latter being the peak subsite number recorded (650 individuals).

Foraging Distribution

Brent Geese are grazers and are known for their preference for foraging in intertidal areas with the Eelgrass *Zostera* sp. (Robinson et al. 2004). They may also feed upon algae species, particularly filamentous green algae, saltmarsh plants, and they also graze terrestrially.

Intertidal foraging was recorded relatively rarely with 17 individuals foraging within 00L05 (Cullenstown) on 11/11/11 and 430 foraging within 00L06 (Blackstone) on 09/12/11. 128 Brent Geese foraged intertidally across four subsites on 12/11/11; 555 of these within 00L05 (Cullenstown) with smaller numbers within 00L03, 00L06 and 00L08. Four individuals foraged within 00L13 (Ballymadder beach) on 08/12/12.

Green filamentous algae (*Ulva* spp.) and *Ulva lactuca* are present extensively in 00L03 and 00L04.

Subtidal foraging was largely confined to 00L05 (Cullenstown) and recorded in all five surveys. The peak number was 74 Brent Geese on 12/11/11.

Supratidal foraging was recorded in three subsites on 12/11/11 with 16, 82 and 72 geese within 00L05, 00L06 and 00L07 respectively.

Terrestrial foraging was recorded once; 650 within 00602 (Duncormick Hill) on 08/02/12 which was also the subsite peak count, but terrestrial foraging is likely to occur regularly around this coastal site and both inside and outside of the SPA boundary.

Roosting Distribution

Relatively little roosting/other behaviour was recorded in intertidal habitat during low or high tide surveys with the exception of 08/02/12 when 340 Brent Geese roosted intertidally within 00L07 (Cull Island) in the north of the subsite together with a further 50 individuals that roosted/other subtidally.

Subtidal roosting/other behaviour was recorded in four subsites overall (00L03, 00L04, 00L05 and 00L07) on 11/10/11, 12/11/11, 09/12/11 and 08/02/12 respectively (16, 12, 2, 50 individuals).

During the high tide survey (16/01/12), 188 Brent Geese roosted subtidally in 00L03 in the south-east of the subsite.

The November 2011 roost survey recorded just three individuals roosting/other in 00L07. A total of 333 Brent Geese foraged on this date across six subsites (00L02, 00L03, 00L04, 00L05, 00L06 and 00L07).

The February 2012 roost survey recorded roosts in three subsites (00L03, 00L04 and 00L06). The largest flock of 300 individuals was in 00L06 (Blackstone) and positioned subtidally at times, but these birds were recorded moving between the estuary and terrestrial grasslands to the east (00601) to forage. The second largest flock was of 249 individuals that roosted subtidally in the south-west corner of 00L03. An additional 20 individuals were recorded roosting subtidally in 00L04.

Shelduck *Tadorna tadorna* - Family (group): Anatidae (ducks)

Tadorna tadorna has five known populations which breed across temperate Eurasia. The northwest Europe population breeds and winters along coasts of Britain, Ireland, Scandinavia, the Baltic and continental Europe. Although a breeding species in Ireland, Shelducks undertake a moult migration each autumn. Large moult gatherings occur along traditionally used areas of the north German coast of the Wadden Sea although several sites in Britain have also become recognised as important moulting areas such as Bridgewater Bay (Severn Estuary), the Humber Estuary, the Wash, and the Firth of Forth. Following the moult, the ducks then migrate to wintering areas.

Numbers

Numbers of Shelduck across the site were relatively low throughout the study and peaked at just 37 individuals on 09/12/11. 27 Shelduck were present during the high tide survey. No whole-site count exceeded the threshold of all-Ireland importance.

Shelduck were recorded in four subsites during low tide surveys (0OL03, 0OL06, 0OL08 and 0OL12). 0OL08 (The Cull) held highest numbers during the first three surveys, numbers peaking at 37 on 09/12/11. 0OL03 (Seafield) held peak numbers (30) on 08/12/12. 0OL02 and 0OL08 recorded this species during the high tide survey only.

Foraging Distribution

Shelducks can forage in a variety of ways from scything their bill through wet mud on exposed tidal flats, to dabbling and scything in shallow water and up-ending in deeper waters. Shelducks can therefore forage throughout the tidal cycle. Foraging distribution of Shelduck has been linked to the distribution of a favoured prey *Peringia (Hydrobia) ulvae* (Bryant & Leng, 1975; Murphy et al. 2006) which can be preyed upon by a variety of feeding methods depending on whether the tidal flats are exposed (e.g. scything) or covered with shallow water (head dipping) or deeper water (upending).

Shelduck were irregularly recorded foraging. 17 foraged intertidally within 0OL08 (The Cull) on 12/11/11 and 37 foraged subtidally there on 09/12/11. 22 Shelduck foraged in this subsite during the high tide survey (17 intertidally plus five subtidally). The Cull (0OL08) is assigned the broad benthic community 'mixed sediment to sand with nematodes and *Tubificoides benedii*' and in the inner reaches such as 0OL08 the sediment is sandy mud. The distinguishing species of this community complex include unidentified nematodes, the oligochaete *Tubificoides benedii* and unidentified oligochaetes of the family Enchytraeidae, the polychaetes *Pygospio elegans* and *Eteone longa*, and the amphipod *Corophium volutator*. Other species present include the gastropod *Peringia (Hydrobia) ulvae*, the polychaete *Hediste diversicolor* and the bivalves *Cerastoderma edule* and *Mya arenaria*. On closer examination of benthic invertebrate data for the site reveals that *Peringia (Hydrobia) ulvae* was recorded from five subsites: 0OL03, 0OL04, 0OL05, 0OL06, and 0OL08, with 0OL08 recording the species in three separate sampling areas.

Roosting Distribution

Few records were made of Shelduck in roosting/other behaviour during low tide surveys; four individuals roosted within 0OL08 (The Cull) and three roosted within 0OL06 (Blackstone) on 11/10/11 and 12/11/11 respectively. Seafield (0OL03) supported three roosting individuals (subtidal) during the final low tide survey. Four individuals roosted subtidally within 0OL07 (Cull Island) during the high tide survey.

The November 2011 roost survey recorded just one flock of 45 roosting Shelduck in 0OL07. These birds were positioned in supratidal habitat (saltmarsh) to the south of the channel.

The February 2012 roost survey recorded just three individuals roosting terrestrially in 0OL12. An additional ten individuals were recorded foraging in 0OL06 (Blackstone).

Golden Plover *Pluvialis apricaria* - Family (group): Charadriidae (wading birds)

The Eurasian Golden Plover is a Palearctic species, occurring mainly at higher latitudes of Western Europe to north-central Siberia and wintering south in Europe, north Africa and parts of Asia. Two subspecies are currently described. *P. a. altifrons* is the 'northern' form and breeds at high latitudes in Western Eurasia from Iceland and the Faeroes across northern Scandinavia to 125°E in the north Siberia lowlands south of Taymyr (Delaney et al. 2009). The nominate *P. a. apricaria* breeds at more southerly latitudes including Ireland and Britain and migrates south for winter. Golden Plovers that winter in Ireland are thought to be mostly Icelandic-breeding birds *P. a. altifrons* (Wernham et al. 2002).

Numbers

Whole site numbers of Golden Plover peaked in November 2011 (5,720). Numbers recorded in the last three low tide surveys all surpassed the threshold of all-Ireland importance (1,200). 737 Golden Plover were recorded during the high tide survey.

During low tide surveys Golden Plovers were recorded from five subsites: 0OL03, 0OL06, 0OL07, 0OL08 and 0OL11. Terrestrial subsites 0O602 and 0OL12 plus 0OL05 recorded this wader during the high tide survey. Peak numbers were held by 0OL08, 0OL07, 0OL03 and 0OL08 for the four low tide survey dates respectively. The subsite peak count was 5,701 individuals recorded for 0OL07 (Cull Island) on 12/11/11.

Foraging Distribution

During winter, Golden Plovers feed primarily within agricultural grassland and arable land. Tidal flats are used more as a roosting/resting habitat and the birds tend to favour large, open tidal flats. As a consequence, Golden Plovers tend to be in large aggregations when observed upon tidal flats. Intertidal feeding is observed to a greater degree during cold weather periods when grassland feeding areas are frozen over. Terrestrially, Golden Plovers eat a wide range of invertebrate species including small earthworms, beetles and millipedes (Gillings & Sutherland, 2007), but relatively little is known about their intertidal feeding patterns (Gillings et al. 2006).

With the exception of nine individuals on 12/11/11 (0OL03 and 0OL07), Golden Plovers were not recorded foraging intertidally.

Ten individuals foraged terrestrially within 0OL11 (Killag fields) on 09/12/11 and 60 foraged terrestrially within 0O602 (Duncormick Hill) during the high tide survey. Terrestrial foraging is likely to occur on a regular basis outside of the SPA boundary.

Roosting Distribution

The majority of Golden Plovers were recorded roosting intertidally at this site. In October 2011 a single flock of 980 individuals roosted centrally in 0OL08 (The Cull). The following month 0OL07 (Cull Island) held a total of 5,693 individuals; one flock of 1,220 pushed up against saltmarsh in the east of the subsite and another flock of 4,473 positioned further west in intertidal habitat. Once-off records were made for 0OL06 (Blackstone) (18 individuals) and 0OL03 (Seafield) (2,640 individuals).

Supratidal roosting was recorded during the high tide survey; 14 and 433 individuals within 0OL05 and 0OL07 respectively.

The November 2011 roost survey recorded roosting Golden Plover across four subsites (0OL02, 0OL03, 0OL07 and 0OL12). The largest single flock of 1,243 birds were positioned supratidally in 0OL02 within an area of *Spartina*. The second largest flock of 80 individuals roosted terrestrially in 0OL12; along with a second flock of 25 individuals. 75 Golden Plover roosted supratidally in 0OL07 and a further eight individuals roosted supratidally in 0OL08.

The February 2012 roost survey recorded just two roosting individuals within 0OL06 (Blackstone).

Grey Plover *Pluvialis squatarola* - Family (group): Charadriidae (wading birds)

The Grey Plover is generally considered a monotypic species and has a holarctic breeding distribution across the tundra of Eurasia and North America (Delaney et al. 2009). The species migrates from breeding areas to a very wide wintering range extending to the coastlines of Africa, south and east Asia, Australasia and South America (BWPI, 2004). In Ireland, Grey Plovers occur as both passage and wintering birds and are thought to originate from Russian breeding populations (Wernham et al. 2002).

Numbers

Grey Plovers were recorded in all surveys undertaken. Whole-site numbers were variable, and peaked at 103 individuals on 08/02/12. 127 individuals were present during the high tide survey. The latter two low tide surveys plus the high tide survey recorded whole-site numbers that exceeded the threshold of all-Ireland importance.

Grey Plovers were recorded in five subsites (00L03, 00L04, 00L06, 00L07 and 00L08). Peak numbers were held by 00L08 (The Cull), 00L03 (Seafield), 00L07 (Cull Island) and 00L06 (Blackstone) for the four low tide surveys respectively.

Foraging Distribution

During winter Grey Plovers mainly forage intertidally and have a characteristic mode of foraging whereby they stand motionless watching the mudflat surface before snatching a prey item (often a worm) from the sediment surface. Grey Plovers take a wide range of prey species including Lugworms (*Arenicola marina*), Ragworms (*Hediste diversicolor*), amphipod crustaceans and small bivalves (e.g. *Macoma balthica* and *Scrobicularia plana*) (Dit Durrell & Kelly, 1990; Moreria, 1996).

Grey Plovers were recorded foraging intertidally within five subsites: 00L03, 00L04, 00L06, 00L07 and 00L08. Peak numbers were held by 00L08 (The Cull), 00L03 (Seafield), 00L07 (Cull Island) and 00L06 (Blackstone) for the four low tide surveys respectively. These subsites are assigned the broad benthic community 'mixed sediment to sand with nematodes and *Tubificoides benedii*'. The distinguishing species of this community complex include unidentified nematodes, the oligochaete *Tubificoides benedii* and unidentified oligochaetes of the family Enchytraeidae, the polychaetes *Pygospio elegans* and *Eteone longa*, and the amphipod *Corophium volutator*. Other species present include the gastropod *Peringia (Hydrobia) ulvae*, the polychaete *Hediste diversicolor* and the bivalves *Cerastoderma edule* and *Mya arenaria*.

00L06 (Blackstone) supported the largest number recorded at any time (64 individuals) and on balance greater numbers occurred in the inner eastern part of the site where the sediment is sandy mud and where species such as *Corophium volutator*, *Hediste diversicolor* and *T. benedii* occur in their greatest abundance.

The highest intertidal foraging density recorded for a single subsite was 1.7 Grey Plover ha⁻¹ (00L07 Cull Island). 00L06 (Blackstone) also recorded a density of over 1.5 Grey Plover ha⁻¹ on one occasion. The whole site mean feeding density (intertidal habitat) was 0.2 Grey Plover ha⁻¹.

Roosting Distribution

During low tide surveys, relatively few records were made of Grey Plovers in roosting/other behaviour; low numbers (<6 birds) recorded for 00L03, 00L06 and 00L07 on single occasions. During the high tide survey, 25 Grey Plovers roosted intertidally within 00L07 (Cull Island) and a single bird was recorded in 00L03 (Seafield). 101 individuals on this date roosted supratidally; the majority (81) in 00L03 (Seafield) roosting on a rocky spit in the south west of the subsite. Smaller numbers were recorded in 00L05, 00L06 and 00L08.

The November 2011 roost survey recorded four flocks of roosting Grey Plover across three subsites (00L02, 00L03 and 00L06). 00L03 (Seafield) held two flocks and the largest flock of 58 individuals that roosted on a rocky spit in the south west of the subsite (as above). These birds then moved as the tide rose and took up position within 00L02. An additional roost of 20 individuals was recorded 30 minutes later. 00L06 (Blackstone) supported a roost of 16 Grey Plovers (likely an underestimate) that were partially hidden in saltmarsh in the south of the subsite.

The February 2012 roost survey recorded just two individuals roosting in each of 00L03, 00L06 and 00L07.

Lapwing *Vanellus vanellus* - Family (group): Charadriidae (wading birds)

The Lapwing is a monotypic species and has a wide Palearctic breeding distribution from Britain and Ireland in the west to Eastern and southern Siberia in the east with a southern limit extending into Spain (Delaney et al. 2009). Birds breeding in Britain and Ireland are partial migrants with some residing over winter and some migrating south. The wintering population is enhanced by Lapwings moving in from continental Europe and northern and western Britain (Wernham et al. 2002). Cold weather movements can result in a greater flux of birds to Ireland's estuaries.

Numbers

Whole site numbers of Lapwing rose from just 59 in October 2011 to a site peak of 5,226 on 08/02/12. 3,421 Lapwing were recorded during the high tide count on 18/01/12. All counts with the exception of the October low tide survey recorded whole-site numbers that exceeded the threshold of all-Ireland importance.

Across the survey programme, Lapwings were recorded within eight subsites (0M408, 0M409, 0M430, 0M431, 0M433, 0M434, 0M436 and 0M501). 0M433 only recorded this species during the high tide survey.

Lapwings were recorded in seven subsites during low tide surveys (0OL03, 0OL04, 0OL05, 0OL06, 0OL07, 0OL08 and 0OL11). Terrestrial subsites 0O601, 0O602 and 0OL12, together with 0OL02, recorded this species during the high tide survey

Peak numbers during low tide surveys were recorded for 0OL07, 0OL03, 0OL03 and 0OL08 for the four dates respectively.

Foraging Distribution

Lapwings are traditionally 'inland' waders. During winter they can be observed across a wide variety of habitats, principally using lowland farmland and freshwater wetlands (e.g. turloughs and callows) but also coastal wetlands where they feed on a variety of soil and surface-living invertebrates. They are opportunistic and mobile birds and will readily exploit temporary food sources such as newly-ploughed fields. Estuaries are typically used as roosting areas where large flocks may be observed roosting upon the tidal flats but coastal areas will also be used to a greater degree during cold weather events when farmland and freshwater habitats freeze over. There is evidence in the UK that utilisation of coastal habitats has increased, coupled with an increase in intertidal feeding (Gillings et al. 2006).

Irregular records were made of Lapwings foraging intertidally in subsites 0OL05 (Cullenstown), 0OL06 (Blackstone) and 0OL07 (Cull Island); the maximum number being 14 individuals in 0OL05 (Cullenstown) on 09/12/11.

Roosting Distribution

Lapwings were recorded roosting/other intertidally in six subsites: 0OL03, 0OL04, 0OL05, 0OL06, 0OL07 and 0OL08. Peak numbers during low tide surveys were recorded for 0OL07, 0OL03, 0OL03 and 0OL08 for the four dates respectively. 0OL08 (The Cull) was notable for supporting numbers ranked highest or second highest on all three occasions that roosting Lapwings were observed there. 0OL03 (Seafield) also held peak numbers during the high tide survey.

During the high tide survey the majority of Lapwings roosted terrestrially. 1,760 Lapwings were distributed across four subsites: 0O601, 0O602, 0OL07 and 0OL12.

The November 2011 roost survey recorded 12 flocks roosting across eight subsites (0OL02, 0OL03, 0OL04, 0OL05, 0OL06, 0OL07, 0OL08 and 0OL12). By far the largest flock of 1,532 individuals roosted in saltmarsh in the south of 0OL07 (Cull Island); smaller numbers (32) roosted supratidally on Cull island itself (0OL07 also). To the east flocks of 259 and 325 Lapwing roosted in grassland of 0OL12. 0OL06 (Blackstone) held three flocks (17, 310 and 130 Lapwing) that roosted either supratidally or terrestrially; the latter just outside of the subsite. A flock of 175 Lapwing foraged terrestrially to the east of this subsite. 0OL08 held a single flock of 277 Lapwing that roosted in *Spartina* in the south-east of the subsite.

The February 2012 roost survey held ten flocks of roosting Lapwing across seven subsites (0OL02, 0OL03, 0OL04, 0OL06, 0OL07, 0OL08 and 0OL12). The largest flock of 2,800 Lapwing were 'flighty' due to consistent disturbance and observed mostly in flight although landing occasionally in saltmarsh of 0OL02. These flocks were observed to be disturbed by raptors (Merlin and Peregrine Falcon) and as a consequence were counted more than once in different positions.

A single flock of 2,000 roosted centrally in 0OL08 (The Cull) while a flock of 200 roosted nearby on Cull Island (in 0OL07). Three flocks were recorded in 0OL06; 162 roosted intertidally amongst a mixed wader flock also comprising Black- and Bar-tailed Godwits. Similarly 533 Lapwing roosted alongside the channel together with other species that both roosted and foraged such as Teal, Curlew, Dunlin and Redshank. A further 300 Lapwing roosted along the southern edge of the subsite. Smaller flocks (<200 individuals) roosted in 0OL03, 0OL04, and 0OL12.

Black-tailed Godwit *Limosa limosa* - Family (group): Scolopacidae (wading birds)

Black-tailed Godwits *Limosa limosa* have a widespread Palearctic breeding distribution. Four populations are recognised – three populations of the nominate *L. l. limosa* and one *L. l. islandica*, the latter of which breeds almost exclusively in Iceland and winters in Britain, Ireland, Spain, Portugal and Morocco (Delaney et al. 1999). Recoveries and sightings confirm that Black-tailed Godwits wintering in Ireland are of the *islandica* race, whereas further south (e.g. Spain and Portugal) some mixing of *limosa* and *islandica* occurs in the non-breeding season (Wernham et al. 2002).

Numbers

Numbers of Black-tailed Godwits during low tide surveys ranged from 50 (11/10/11) to a peak of 356 individuals (08/02/12). 166 were counted during the high tide survey (16/01/12). No whole-site count surpassed the international threshold but the last three low tide surveys recorded numbers that exceeded the all-Ireland threshold.

This wader was recorded in eight subsites during low tide surveys (00601, 00L03, 00L04, 00L06, 00L07, 00L08, 00L10 and 00L11) but only three subsites (00L03, 00L04, 00L06) held the species on more than one occasion.

Peak numbers were recorded by 00L03 (Seafield) on three survey occasions (11/10/11, 12/11/11 and 09/12/11) and by 00601 (Blackstone fields & racetrack) on 08/02/12.

00L03 (Seafield) recorded the peak subsite count of 220 individuals on 12/11/11.

Foraging Distribution

Black-tailed Godwits are relatively large long-billed wading birds that forage within intertidal flats for their preferred prey of bivalves such as *Macoma balthica*, *Scrobicularia plana* and *Mya arenaria*. At some sites, polychaete worms may form a larger proportion of the diet and the species is relatively adaptable, utilising other habitats for foraging where available, such as terrestrial grassland, coastal marshes or freshwater callows.

Intertidal foraging was recorded in five subsites (00L03, 00L04, 00L06, 00L07, 00L08). 00L03 (Seafield) held peak numbers on (11/10/11, 12/11/11 and 08/02/12) and on balance appears the more favoured subsite. 00L04 (Lacken) held all intertidally foraging individuals on 09/12/11 but this was just three individuals. 00L08 (The Cull) held foraging individuals just once (08/02/12) but with good numbers (78 birds).

These subsites are assigned the broad benthic community 'mixed sediment to sand with nematodes and *Tubificoides benedii*'. Sediments vary across these subsites with the inner subsites such as 00L03 (Seafield) and 00L08 (The Cull) comprising sandy mud. The distinguishing species of this community complex include unidentified nematodes, the oligochaete *Tubificoides benedii* and unidentified oligochaetes of the family Enchytraeidae, the polychaetes *Pygospio elegans* and *Eteone longa*, and the amphipod *Corophium volutator*. Other species present, although not uniformly distributed, include the gastropod *Peringia (Hydrobia) ulvae*, the polychaete *Hediste diversicolor* and the bivalves *Cerastoderma edule* and *Mya arenaria*. Bivalves are not well represented in the invertebrate community recorded at this site with the exception of *Macoma balthica* (recorded in 00L08) and *Mya arenaria* (recorded in 00L06 and 00L07), so polychaete worms are likely to form a major part of the Black-tailed Godwit diet at this site.

Terrestrial foraging was recorded at this site with 30 Black-tailed Godwits adjacent 00L03 (Seafield) on 11/10/11 and the terrestrial subsite 00601 (Blackstone fields & racetrack) supporting 110 individuals on 08/02/12. The terrestrial subsite 00602 (Duncormick Hill) recorded 117 Black-tailed Godwits foraging during the high tide survey on 16/01/12, and 65 foraged terrestrially in Ballyharty Fields (00L10) on 09/12/11. 43 individuals foraged supratidally within 00L04 (Lacken) during the high tide survey. Terrestrial foraging is likely to occur regularly and both inside and outside the SPA boundary.

The peak intertidal foraging density was 7 Black-tailed Godwits ha⁻¹ recorded for 00L03 (Seafield) on 12/11/11. 00L08 (The Cull) recorded the second highest density of 5 Black-tailed Godwits ha⁻¹. The whole site average intertidal foraging density was 0.4 Black-tailed Godwits ha⁻¹.

Roosting Distribution

Very few records were made of individuals in roosting/other behaviour during low tide surveys with the exception of 00L03 (Seafield) were 2, 46 and 132 individuals roosted intertidally on 11/10/11, 12/11/11 and 09/12/11; with these last two flocks roosting alongside the channel in the inner subsite.

No roosting was observed during the high tide survey; all records made were of foraging individuals (see above).

The November 2011 roost survey also recorded no roosting birds but 170 individuals foraged terrestrially to the east of 00L06 with small numbers (6) foraging terrestrially in two other locations.

The February 2012 roost survey recorded five roosting flocks across three subsites (00L03, 00L04 and 00L06). The largest flock of 150 birds roosted along the top of the shore in the south-eastern section of 00L03 (Seafield). 64 Black-tailed Godwits roosted intertidally in 00L05; nearby roosts supporting good numbers of Lapwing (185) and Curlew (48). 00L06 held two roosts of 55 and 62 individuals positioned intertidally.

Bar-tailed Godwit *Limosa lapponica* - Family (group): Scolopacidae (wading birds)

The Bar-tailed Godwit has a widespread breeding distribution across the sub-arctic and low Arctic zones of the Palearctic and extending into western Alaska (Delaney et al. 2009). The taxonomy of the species is complex but five subspecies are generally recognised. The nominate subspecies *L. l. lapponica* breeds across the higher latitudes of Northern Europe, Russia and Siberia and west and winters mainly in Western Europe, including Ireland. The Wadden Sea is used by *L. l. lapponica* and other populations as a staging and moulting area in autumn and spring.

Numbers

Low tide numbers ranged rose steadily from 54 on 11/10/11 to a peak of 112 on 08/02/12. A peak number of 217 were recorded during the high tide survey and only this count exceeded the all-Ireland threshold.

Bar-tailed Godwits were recorded in six subsites overall (0OL03, 0OL04, 0OL05, 0OL06, 0OL07 and 0OL08). Peak numbers were supported by 0OL03 (Seafield), 0OL06 (Blackstone)/0OL07 (Cull Island) (joint), 0OL08 (The Cull) and 0OL03, for the four low tide dates respectively.

The subsite peak count of 74 was recorded by 0OL08 (The Cull) on 09/12/11.

Foraging Distribution

Bar-tailed godwits are a wader species considered characteristic of coastal wetland sites dominated by sand. The birds forage by probing within intertidal sediment for invertebrate species, predominantly large polychaete worms such as *Arenicola marina* and *Nephtys* sp (e.g. Scheiffarth, 2001). The species is characteristic of sites with sandy substrates (e.g. Hill et al. 1993; Summers et al. 2002).

Bar-tailed Godwits foraged across six subsites overall (0OL03, 0OL04, 0OL05, 0OL06, 0OL07 and 0OL08). 0OL05 (Cullenstown) recorded this activity just once but all other subsites supported foraging individuals on three or more occasions.

Peak numbers were supported by 0OL06 (Blackstone), 0OL06 (Blackstone)/0OL07 (Cull Island) (joint), 0OL08 (The Cull) and 0OL03 (Seafield), for the four low tide dates respectively.

These subsites are assigned the broad benthic community 'mixed sediment to sand with nematodes and *Tubificoides benedii*'. Sediments vary across these subsites with the inner subsites such as 0OL03 (Seafield) and 0OL08 (The Cull) comprising sandy mud. The distinguishing species of this community complex include unidentified nematodes, the oligochaete *Tubificoides benedii* and unidentified oligochaetes of the family Enchytraeidae, the polychaetes *Pygospio elegans* and *Eteone longa*, and the amphipod *Corophium volutator*. Other species present, although not uniformly distributed, include the gastropod *Peringia (Hydrobia) ulvae*, the polychaete *Hediste diversicolor* and the bivalves *Cerastoderma edule* and *Mya arenaria*. *Arenicola marina* was recorded as abundant on the north shore in 0OL04 and in the inner estuary (0OL03). *Nephtys hombergi* was recorded from intertidal samples taken from 0OL04 and from subtidal samples taken within 0OL05 and likely occurs in other subsites on the lower shore and hence would be available to foraging Bar-tailed Godwits, especially on spring tides.

The highest intertidal foraging density recorded for a single subsite was 5 Bar-tailed Godwits ha⁻¹ (0OL08 The Cull) on 09/12/11. Only two other subsites (0OL03 and 0OL07) recorded densities greater than 1 Bar-tailed Godwit ha⁻¹. The whole site mean feeding density (intertidal habitat) was 0.3 Bar-tailed Godwits ha⁻¹.

Roosting Distribution

During low tide surveys, Bar-tailed Godwits were rarely recorded roosting intertidally, very low numbers recorded once in 0OL04 and 0OL07. The exception was 35 individuals that roosted intertidally in 0OL03 (Seafield) on 11/10/11.

0OL03 (Seafield) supported 12 individuals roosting intertidally during the high tide survey with another 11 positioned supratidally. 150 Bar-tailed Godwits roosted supratidally at the edge of Cull Island (0OL07).

The November 2011 roost survey recorded two flocks of 19 and 195 individuals in 0OL02 and 0OL06 respectively; the latter roosting supratidally along the southern boundary of the subsite.

The February 2012 roost survey recorded three flocks in 0OL06. These flocks comprising 27, 25 and 21 individuals were positioned supratidally along the southern edge of the subsite (two flocks) and as part of a mixed-species intertidal roost positioned centrally in the subsite. 0OL03 supported two roosts including one of 151 individuals that roosted alongside 200 Dunlin on the rocky spit in the south west of the subsite. The other flock of 52 individuals were part of a mixed-species roost that were positioned on the southern boundary of the subsite at the tip of subsite 0OL02.

5.4 Ballyteige Burrow - Activities and Events

5.4.1 Introduction

The overriding objective of the Habitats Directive is to ensure that the habitats and species covered achieve 'favourable conservation status' and that their long-term survival is secured across their entire natural range within the EU (EU Commission, 2012). In its broadest sense, favourable conservation status means that an ecological feature is in a satisfactory condition, and that this status is likely to continue into the future.

At site level, the concept of 'favourable status' is referred to as 'conservation condition.' This can relate not only to species numbers, but importantly, to factors that influence a species abundance and distribution at a site. The identification of activities and events that occur at a designated site is therefore important, as is an assessment of how these might impact upon the waterbird species and their habitats, and thus influence the achievement of favourable condition. Site-based management and the control of factors that impact upon species or habitats of conservation importance are fundamental to the achievement of site conservation objectives.

Section 5 of this report provides information on activities and events that occur in and around Ballyteige Burrow that may either act upon the habitats within the site, or may interact with the Special Conservation Interest species and other waterbirds using the site.

5.4.2 Assessment Methods

Information on 'activities' and 'events' across the site was collected during a desk-top review which included NPWS site reporting files, County Development and other plans (e.g. Wexford County Council, 2012), South Eastern River Basin District documents (e.g. SERBD, 2010a), and other available documents relevant to the ecology of the site.

In addition, information was collected during the 2011/12 waterbird survey programme (NPWS, 2011) as field workers recorded activities or events that occurred at the site during their survey work. This information, together with results from a 'site activity questionnaire' provides valuable information gained from 60+ hours of surveyor effort across the site. All data collected were entered into a database but as the dataset will be subject to change over time, the assessment should be viewed as a working and evolving process.

The 'activities' and 'events' were categorised using the standard EU list of pressures and threats as used in Article 12 reporting under the EU Birds Directive. Only factors likely to directly or indirectly affect waterbirds were included but the resulting list is broad and includes built elements (e.g. man-made structures such as roads and bridges that are adjacent to the site), factors associated with pollution (e.g. discharges from waste water treatment plants), various recreational and non-recreational activities as well as biological factors such as the growth of the invasive plant species *Spartina anglica*.

Data are presented in three ways:-

1. Activities and events identified to occur in and around Ballyteige Burrow (through either the desk-top review or field survey programme) are listed in relation to the subsite within which they were observed or are known to occur. The activities/events are classified as follows:

- O** observed or known to occur within Ballyteige Burrow;
- U** unknown spatial area hence all potential subsites are included (e.g. fisheries activities);
- H** historic, known to have occurred in the past.
- P** potential to occur in the future.

2. Of the activities and events identified to occur in and around Ballyteige Burrow, those that have the potential to cause disturbance to waterbird species are highlighted.
3. Data from the 2011/12 waterbird survey programme were used to inform an assessment which examined the level of disturbance caused by activities recorded during field surveys. The methodology was adapted from that used for monitoring Important Bird Areas (IBAs) (Birdlife International, 2006) and involved assigning scores which ranged between 0 and 3, to three selected attributes of each disturbance event (1) frequency/duration; (2) intensity and (3) likely response of waterbirds (after Hill et al. 1997) (Table 5.7). The rationale for scoring is provided in Appendix 10.

Table 5.7 Scoring system for disturbance assessment

Frequency/Duration	(A) Timing Score	Intensity	(B) Scope Score	Response	(C) Severity Score	TOTAL SCORE A + B + C
Continuous	3	Active, high-level	3	Most birds disturbed all of the time	3	9
Frequent	2	Medium level	2	Most birds displaced for short periods	2	6
Infrequent	1	Low-level	1	Most species tolerate disturbance	1	3
Rare	0	Very low-level	0	Most birds successfully habituate to the disturbance	0	0

The scores assigned to the three attributes were then added together to give an overall 'disturbance score' which is used to define the extent of the impact as follows:-

Scores 0 – 3 = **Low**
 Scores 4 – 6 = **Moderate**
 Scores 7 – 9 = **High**

The attributes (1) frequency/duration and (3) response were scored based on field survey observations. Attribute (2) intensity was scored based on a combination of field survey observations and best expert opinion.

5.4.3 Overview of activities at Ballyteige Burrow

Activities and events identified to occur in and around Ballyteige Burrow are shown in Appendix 9, listed in terms of the subsites surveyed during the 2011/12 Waterbird Survey Programme. Activities highlighted in grey are those that have the potential to cause disturbance to waterbirds (see Section 5.4.4).

The following pages outline the range of activities and events that occur across the site using the following headings: (1) habitat loss, modification and adjacent landuse; (2) water quality; (3) fisheries and aquaculture; (4) recreational disturbance; and (5) others.

Habitat loss, modification and adjacent landuse

Ballyteige Burrow is located on the south coast of Co. Wexford between the town of Kilmore Quay and Cullenstown. The site is dominated by a long sand and shingle barrier (spit) which supports an impressive dune complex known as the Burrow. On the seaward side is a long beach, approximately 8km in length. Behind the spit lies a shallow, tidal sea inlet and estuary

of the Duncormick River (The Cull). The eastern portion of this intertidal system was reclaimed in the 19th century by construction of the Cull Bank (sea wall) and a pumping station and is now polderland (Killag). The OPW manages the Pump House at the Cull.

The western portion of The Cull retains semi-natural habitat including mudflats which are exposed at low tide, and saltmarsh. The area around Ballyteige is generally low lying and land around the site is dominated by farmland. Polderland comprises mostly improved grassland and arable land (McCorry & Ryle, 2009).

Access to the site is relatively limited, with local roads adjacent to the site in a few places only; other access via farm tracks. The only access to the Ballyteige spit is at the far eastern end near Kilmore Quay.

Duncormick is the main settlement near the site, and through which the Duncormick River flows into the estuary. A quarry (sand and gravel extraction) lies in polderland adjacent subsite 00L12.

Most of Ballyteige Burrow is a state-owned Nature Reserve, managed by NPWS. A management agreement with a local landowner facilitates a limited number of cattle to graze on Ballyteige Burrow during the winter; the objective of the grazing being to promote habitat diversity and maintain a species-rich short turf in the sand dune habitats (McCorry & Ryle, 2009).

The introduced and invasive species *Spartina anglica* is present on the mudflats and is most prevalent near Cull Bank (00L07). Its spread may be affecting sedimentation and the growth of saltmarsh. Grazing of saltmarsh habitat has been noted previously.

McCorry & Ryle (2009) report that saltmarsh at the site was historically more extensive before the land behind the Cull Bank was reclaimed, this reclamation having had a significant impact on the development of saltmarsh, which has only developed to its current state within the past 150 years. Further reclamation occurred between the Cull Bank since the 1920s and the channels have since narrowed and saltmarsh has developed in these old channel areas. Areas of marsh including saltmarsh have also been drained and improved. The main channel is periodically dredged for maintenance purposes. Further disturbance may be necessary in the future in response to maintenance work related to the Cull Pumphouse and management of the polderlands.

Water quality

The South Eastern River Basin District (SERBD) River Basin Management Plan 2009 – 2015 covers the implementation of the Water Framework Directive (WFD) (2000/60/EEC) for the south east coast of Ireland and covers Ballyteige Burrow and its inflowing rivers.

The South Eastern River Basin Transitional and Coastal Waters Action Programme (SERBD, 2010a) reports a 'moderate' status for Ballyteige Burrow, based on sub-standard ecological status¹⁶. Some insight to causative factors is given in the Ballyteige/Bannow Water Management Unit Action Plan (SERBD, 2010b) where the status of the Duncormick River is given as 'moderately polluted' (poor status) in its lower reaches. The Duncormick and environs agglomeration discharges waste water, of a secondary standard, to the Duncormick River, and this WWTP is classified as 'at risk' by SERBD (2010b).

Fisheries & aquaculture

¹⁶ Defined by the WFD as 'an expression of the structure and functioning of aquatic ecosystems associated with surface waters'.

Fishing in Ballyteige Burrow is largely recreational with shore angling taking place mostly off the strand.

Various commercial inshore fishing activities are likely to occur adjacent to the site (detail and spatial scale unknown).

Intertidal aquaculture (trestles) and activities associated with aquaculture were observed during the Waterbird Survey Programme in subsites 00L04 and 00L05. Bait-digging was recorded from two subsites (00L03 and 00L06) while the hand-gathering of molluscs was recorded from one subsite (00L05).

Recreational disturbance

In general, recreational activities across the site are limited because of the site's relative inaccessibility. The main access points to the shore are at Kilmore Quay and Cullenstown and in the summer season both locals and tourists use accessible areas of the coastal strip for walking, swimming and beach recreation, while in the winter the coast is popular for recreational walking. Due to the shelved nature of the coastline, swimming in this area is dangerous (NPWS, 2000).

Damage had been caused previously to the dune system by horse-riding but this activity is now prohibited.

Motorbikes have been recorded previously in the dune system (e.g. McCorry & Ryle, 2009).

Others

Wildfowling was not recorded at the site during the 2011/12 Waterbird Survey Programme but has occurred at the site in the past.

Disturbance to waterbirds caused by raptors was noted on various occasions at this site, the raptor species involved being Peregrine Falcon (*Falco peregrinus*), Hen Harrier (*Circus cyaneus*), Merlin (*Falco columbarius*), Sparrowhawk (*Accipiter nisus*) and Kestrel (*Falco tinnunculus*). This was particularly noticeable during high tide roost surveys when raptor activity caused some flocks e.g. Lapwing and small waders to be highly mobile.

5.4.4 Disturbance Assessment

During the 2011/12 Waterbird Survey Programme, six activities/events were recorded that caused disturbance to waterbirds. These were: bait diggers, walking (including with dogs), motorised vehicles, horse-riding, hand-gathering of molluscs (winkle picking), and activities associated with aquaculture. In addition, disturbance was noted to occur from an over-flying Hen Harrier on one occasion (subsite 00L06).

Walking (including with dogs) was the most widespread activity and occurred in six subsites overall, accounting for the peak disturbance score in five of these. The presence of dogs leads to a higher score as a result of the higher 'intensity' of the activity. The majority of records however reported the presence of walkers for less than the total survey period i.e. a reasonably short event.

In general most activities were recorded on relatively few occasions, bait-digging, mollusc gathering and horse riding recorded in subsites only once. Activities associated with aquaculture were also observed only once during the survey programme.

A summary of the disturbance assessment is shown in Table 5.8 and full results are shown in Appendix 10. As a final review, Table 5.9 shows the peak disturbance scores overlaid on the subsite assessment table (total waterbird numbers, LT surveys).

Table 5.8 Disturbance Assessment Summary Table

Number of activities recorded during field surveys (2011/12 waterbird survey programme) observed to cause disturbance to waterbirds. The calculated peak disturbance score is shown (see text for explanation).

Scores 0 – 3 = **Low** Scores 4 – 6 = **Moderate** Scores 7 – 9 = **High**. Grey shading = no activity recorded.

Subsite Code	Subsite Name	Number Activities	Peak Disturbance Score	Activity Responsible
00601	Blackstone fields & racetrack	0	-	
00602	Duncormick Hill	0	-	
00L02	Duncormick Marsh	0	-	
00L03	Seafield	2	5	• Motorised vehicles
00L04	Lacken	3	6	• Walking (incl. with dogs)
00L05	Cullenstown	3	6	• Walking (incl. with dogs)
00L06	Blackstone	2	5	• Motorised vehicles
00L07	Cull Island	2	6	• Walking (incl. with dogs)
00L08	The Cull	0	-	
00L09	Ballyteige	0	-	
00L10	Ballyharty Fields	0	-	
00L11	Killag Fields	1	5	• Walking (incl. with dogs)
00L12	Inish & Ballyteige Slob	0	-	
00L13	Ballymadder Beach	1	5	• Walking (incl. with dogs)

Table 5.9 Ballyteige Burrow - subsite rankings based on total numbers of waterbirds (LT surveys) by peak disturbance score

Species	PB	SU	GP	GV	L.	BW	BA
Subsites							
00601						V	
00602	V						
00L02							
00L03	H	V	V	V	V	V	V
00L04	M			M	M	M	H
00L05	V				M		
00L06	V	H	M	V	H	M	V
00L07	H		V	V	V	H	V
00L08	L	V	V	V	V	M	V
00L09							
00L10						H	
00L11			H		M	M	
00L12		H					
00L13	L						

5.4.5 Discussion

Many of the 'activities' identified at the Ballyteige Burrow may act so as to modify the wetland habitats. While physical loss might be considered more historic in nature (e.g. land claim/polderisation), on-going modifications to intertidal and coastal habitats may occur due to

changes in natural processes (e.g. sedimentation or erosion rates) as a result of former physical events and these are evident at this site (see McCorry & Ryle, 2009).

Human recreational activities at coastal sites occur less frequently during winter months and the range of activities is much reduced. At Ballyteige Burrow, despite its relative inaccessibility, recreational walking is still noted to be a popular and regular activity within several subsites.

Any activity that causes disturbance can lead to the displacement of waterbirds. The significance of the impact that results from even a short-term displacement should not be underestimated. In terms of foraging habitat, displacement from feeding opportunities not only reduces a bird's energy intake but also leads to an increase in energy expenditure as a result of the energetic costs of flying to an alternative foraging area. Displacement also has knock-on ecological effects such as increased competition (within and/or between different species) for a common food source. In areas subject to heavy or on-going disturbance, waterbirds may be disturbed so frequently that their displacement is equivalent to habitat loss. When disturbance effects reduce species fitness¹⁷ (reduced survival or reproductive success) consequences at population level may result.

Whilst the nature and the frequency of disturbance-causing activities are key factors when assessing likely impacts, many aspects of waterbird behaviour and ecology will influence a species response. Waterbird responses are likely to vary with each individual event and to be species-specific. The significance of a disturbance event upon waterbirds will vary according to a range of factors including:-

- Frequency/duration of disturbance event;
- Intensity of activity;
- Response of waterbirds.

and be influenced by:-

- Temporal availability – whether waterbirds have the opportunity to exploit the food resources in a disturbed area at times when the disturbance does not occur;
- Availability of compensatory habitat - whether there is suitable alternative habitat to move to during disturbance events;
- Behavioural changes as a result of a disturbance - e.g. degree of habituation;
- Time available for acclimatisation - whether there is time available for habituation to the disturbance. (there may be a lack of time for waterbirds during the staging period);
- Age - for example when feeding, immature (1st winter birds) may be marginalised by older more dominant flocks so that their access to the optimal prey resources is limited. These individuals may already therefore be under pressure to gain their required daily energy intake before the effects of any disturbance event are taken into account;
- Timing/seasonality - birds may be more vulnerable at certain times e.g. pre- and post-migration, at the end of the winter when food resources are lower;
- Weather - birds are more vulnerable during periods of severe cold weather or strong winds;
- Site fidelity – some species are highly site faithful at site or within-site level and will therefore be affected to a greater degree than species that range more widely;
- Predation and competition – a knock-on effect of disturbance is that waterbirds may move into areas where they are subject to increased competition for prey resources, or increased predation – i.e. the disturbance results in an indirect impact which is an increased predation risk.

¹⁷ defined as a measure of the relative contribution of an individual to the gene pool of the next generation.

Knowledge of site activities and events is important when examining waterbird distribution and understanding the many factors that might influence a species' distribution across a site. The above points also highlight the complex nature of waterbird behaviour and species specificity, as well as the need for careful consideration of the impacts of disturbance upon waterbird species when undertaking Appropriate Assessments or other environmental assessments. This review could therefore form the starting point for any future study aiming to quantify the effects of activities/disturbance events across the site, as well as to help identify the extent to which existing use and management of the site are consistent with the achievement of the conservation objectives described in Part Three of this document.

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APPENDIX 1

SITE NAME: BALLYTEIGE BURROW SPA

SITE CODE: 004020

This site is located on the south coast of Co. Wexford between the towns of Kilmore Quay and Cullenstown. It comprises a sand and shingle barrier beach, approximately 8 km in length, and the estuary of the Duncormick River. The extensive overlying sand spit is known as the Burrow, while the estuary that it encloses is known as the Cull.

The site has a range of coastal habitats, including various types of sand dunes, salt meadows, and intertidal sand and mud flats. Former estuarine areas adjacent to the site have been reclaimed as polders and are intensively managed for agriculture. The dune system includes embryonic shifting dunes and Marram (*Ammophila arenaria*) dunes along the seaward side with more stable fixed dunes and dune heath inland. Typically, plants such as Marram, Portland Spurge (*Euphorbia portlandica*) and Seaholly (*Eryngium maritimum*) are common on the seaward dunes. The fixed dunes are well-developed and species-rich and include species such as Common Restharrow (*Ononis repens*), Wild Pansy (*Viola tricolor* subsp. *curtisii*), Common Centaury (*Centaureum erythraea*), Wild Thyme (*Thymus praecox*) and Red Fescue (*Festuca rubra*). In places, scrub is encroaching and Bracken (*Pteridium aquilinum*) and Burnet Rose (*Rosa pimpinellifolia*) are common. The dune heath element is typified by Bracken and Gorse (*Ulex europaeus*).

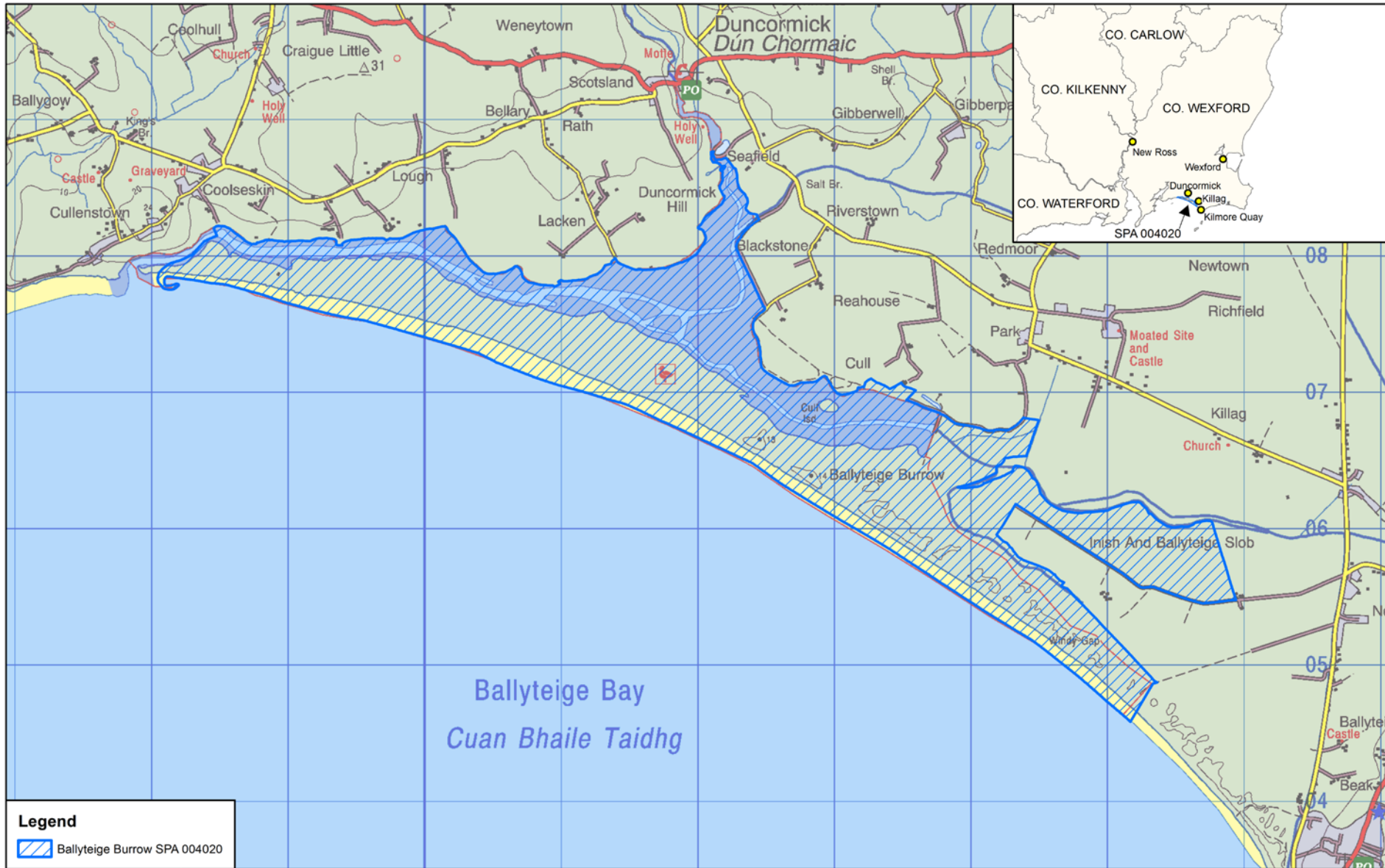
Saltmarsh vegetation fringes The Cull, with such species as Sea Aster (*Aster tripolium*), Sea Arrowgrass (*Triglochin maritima*), Sea Lavender (*Limonium humile*) and Glasswort (*Salicornia* spp.). Part of the saltmarsh complex contains halophilous scrub vegetation, a very rare habitat in Ireland. The estuary empties almost entirely on most tides, apart from the main central channel. Sediments vary from muds in the innermost areas, especially towards Duncormick, to sands elsewhere. In addition to the Duncormick River, the estuary receives the flow from a network of canals which drain the extensive polders to the east and north-east of the site. Water quality of the inflowing freshwater is moderate to poor.

The principal ornithological importance of Ballyteige Burrow SPA is wintering waterfowl, with an internationally important population of Brent Goose (290, average maximum in the five winters 1995/96-1999/00). It also supports nationally important numbers of Shelduck (167), Ringed Plover (133), Golden Plover (4,630), Lapwing (7,808), Black-tailed Godwit (474) and Bar-tailed Godwit (582). A range of other species occurs in numbers of regional importance including Wigeon (306), Grey Plover (69), Dunlin (1,020) and Redshank (206). Both the Golden Plover and Bar-tailed Godwit populations represent just over 3% of the respective national totals, while the Lapwing population is almost 4% of the total. The estuarine habitats provide feeding and roosting areas for the waterfowl species, though a lot of the birds also feed on the intensively managed lands of the adjacent polders. Cullenstown Strand has a small colony of breeding Little Tern, though nesting may not occur in every year.

The site is host to a range of rare Red Data Book plant species, including Wild Asparagus (*Asparagus officinalis*), Borrer's Saltmarsh-grass (*Puccinellia fasciculata*), Perennial Glasswort (*Arthrocnemum perenne*) and Lesser Centaury (*Centaureum pulchellum*), and is the only Irish site for the protected (Flora (Protection) Order, 1999) lichen *Fulgensia fulgens*. The invertebrate fauna of the site includes a number of scarce species, examples being the bumble bees *Bombus distinguendus* and *B. sylvarum*, the jewel wasp *Hedychridium ardens* and the ant *Tetramorium caespitum*.

This coastal site is of high ecological value for its range of good quality coastal habitats, several being listed on Annex I of the E.U. Habitats Directive. It is a major site for wintering waterfowl, with an internationally important population of Brent Goose and a further six species with populations of national importance. Of particular note is that two of the species, Golden Plover and Bar-tailed Godwit, are listed on Annex I of the E.U. Birds Directive. Little Tern is also listed on Annex I of this Directive. Most of the site is designated as a Nature Reserve.

16.2.2004



Legend

 Ballyteige Burrow SPA 004020

An Roinn Ealaíon, Oidhreachta agus Gaeltachta
 Department of Arts, Heritage and the Gaeltacht

BALLYTEIGE BURROW SPA CONSERVATION OBJECTIVES SPA DESIGNATION

Map to be read in conjunction with the NPWS Conservation Objectives SPA Supporting Document.

SITE CODE:
 SPA 004020; version 2.02. CO. WEXFORD

0 0.25 0.5 0.75 1 km

The mapped boundaries are of an indicative and general nature only. Boundaries of designated areas are subject to revision.
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Níl sna teorainneacha ar na léarscálanna ach nod garshuíomhach ginearálta. Féadfar athbhreithnithe a déanamh ar theorainneacha na gceantar comharthaíthe. Suirbhéarachta Ordonáis na hÉireann Ceardúnas Uimh EN 0059214. © Suirbhéarachta Ordonáis na hÉireann Riailtas na hÉireann

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Map Version 1
 Date: April 2014

APPENDIX 2

Waterbird data sources

Irish Wetland Bird Survey (I-WeBS)

I-WeBS began in the Republic of Ireland in 1994/95 and aims to monitor wintering (non-breeding) waterbird populations at the wetland sites upon which they rely. Counts are carried out by volunteers and professional staff of the partner organisations across the months September to March of each year. I-WeBS counts take place on a rising tide or close to high tide. For further information please refer to Crowe (2005) and Boland & Crowe (2012).

The I-WeBS Programme monitors the larger coastal wetland sites together with inland lakes, turloughs, rivers and callows. However the resulting dataset is incomplete for some waterbird species that utilise other habitats such as non-wetland habitat (e.g. grassland used by many species and particularly foraging geese, and swans), non-estuarine coastline, small and ephemeral wetlands and the open sea; the latter of which is obviously difficult to monitor from land-based surveys (Crowe, 2005).

A number of additional and special surveys are therefore conducted on an annual or regular basis and data collected are, where appropriate, integrated into the I-WeBS database. These surveys include those undertaken for swan and geese species that forage typically during daylight hours across terrestrial habitats (e.g. grassland, arable fields) using coastal wetlands sites at night when they congregate to roost. Some of the additional surveys are carried out at certain times, aimed at providing a better estimate of numbers (e.g. Greylag Geese) and for some species an assessment of breeding success during the previous summer (e.g. Light-bellied Brent Geese). These surveys are introduced briefly below and more information is provided in Crowe (2005).

- Swan Surveys

Coordinated international censuses are carried out of the wintering populations of Whooper Swan (*Cygnus cygnus*) and Bewick's Swan (*Cygnus columbianus bewickii*) at four or five-yearly intervals. The surveys are organised by I-WeBS, the Irish Whooper Swan Study group (IWSSG) and WWT.

- Greenland White-fronted Goose

Greenland White-fronted Geese are concentrated at relatively few sites during winter, many of which are non-wetland habitats. The species is therefore not covered adequately by the I-WeBS programme. The Greenland White-fronted Goose census was initiated in the late 1970's and is carried out by NPWS in Ireland and by JNCC and Scottish Natural Heritage (SNH) in Scotland.

- Greylag Geese

Data for the Icelandic breeding population of Greylag Goose that winters in Ireland are taken from special surveys organised through I-WeBS and undertaken during November each year. The surveys aim to assess the distribution and status of the migratory flocks wintering in Ireland and focus on known feeding areas (grassland & agricultural land). When calculating population estimates of the Icelandic birds, data collected are adjusted to account for feral flocks that also occur within Ireland.

- Barnacle Goose (*Branta leucopsis*)

A wintering population from the northeast Greenland breeding population winters mainly on offshore islands along the west coast of Ireland. An aerial survey is conducted of the principal wintering areas every four to five years.

- Light-bellied Brent Geese

Special autumn surveys of this species have been conducted since 1996, organised in Ireland by the Irish Brent Goose Research Group (IBGRG). The survey is currently conducted on a bi-annual basis during the month of October which coincides with the autumn arrival of the species. Data collected are integrated into the I-WeBS database.

APPENDIX 3

Analysing population trends: a synopsis

Monitoring of non-breeding waterbirds has been undertaken by the Irish Wetland Bird Survey (I-WeBS) and its partner, WeBS in Northern Ireland, since the mid 1990's. For such long-term count data, there is clearly a need to assess long-term trends in a consistent and objective manner (Atkinson et al. 2006).

The first stage in the analytical process involves the use of the Underhill Program (Underhill & Prŷs-Jones, 1994) which models the raw monthly counts using a Generalised Linear Model (GLM). As part of this process, it accounts for changes in numbers at the site and the timing of the count (month, year) while also taking into account completed counts and trends at other sites. When counts at a site are flagged as poor quality (e.g. due to poor visibility) or where there are missing values in a given month, then the modelled values are used. This imputation process is used widely to replace missing data points (e.g. Houlahan et al. 2000; Atkinson et al. 2006; Leech et al. 2002; Gregory et al. 2005; Crowe et al. 2008). The resulting dataset is therefore complete for all months and seasons and comprises a combination of actual count data and imputed count data.

This complete dataset is then modelled using a Generalised Additive Models (GAM) which fits a smoothed curve to the counts. GAMs are non-parametric and flexible extensions of the generalised linear model where the linear predictor of the GLM is replaced by a general additive predictor which allows mean abundance to vary as a smooth function of time. Count data are assumed to follow independent Poisson distribution with 0.3T degrees of freedom (e.g. after Atkinson et al. 2006). The application of GAMs to analyse population trends was applied to UK farmland birds by Fewster et al. (2000) and has since been adopted for modelling waterbird trends elsewhere, for example, the UK WeBS Alert system (Leech et al. 2002).

Smoothed count data for a site are then indexed to assess population trends over time. An index number can be defined as a measure of population size in one year expressed in relation to the size of the population in another selected year (Leech et al. 2002). Changes in the index numbers can therefore explain the pattern of population change over time (Underhill & Prŷs-Jones, 1994).

Annual indices are calculated separately for each species at a site. For each year included in an analysis, a total is obtained by summing the number of birds present in a predetermined number of months. The final year in the series of totals is then scaled to equal 100 (please see example in table). Index values in any given year therefore represent the number of individuals relative to those present in the final year. As this process is the same across all species and all sites analysed it allows for some useful comparisons.

Count Data	Index
264.41	128.11
262.21	127.04
234.0	113.37
126.0	61.05
197.23	95.56
206.4	100.00

Un-smoothed indices are also calculated and provide a means of examining ('eye-balling') the variation across time and can also be used to provide a measure of the mean annual change over the entire period. However, the GAM extension to the methodology and resultant smoothed indices allows for the calculation of proportional change in population size between one season and another. This latter calculation is used in Section 4.2 whereby trends are calculated for the 'long-term' 14-year period (1995/96–2009/10) and the recent five-year period (2004/05–2009/10). The values given represent the percentage change in index (population) values across the specified time period, calculated by subtracting the smoothed index value at the start of the time-frame (1995) from the smoothed index value in the reference year (2009):-

$$\text{Change} = ((I_y - I_x) / I_x) \times 100$$

where I_y is the index from the current year and I_x is the index value at the start of the selected time period (see example below)

The reference year is the penultimate year in the time series because, when smoothing, the GAM takes into account values from both the preceding and following year. The last value in the smoothed dataset (2010) is therefore likely to be the least robust because it has no following year.

The final result is therefore % change in population size across a specified time period. Larger values indicate larger proportional changes in population size; positive values indicating relative increases while negative values indicate relative decreases over the specified time period.

Worked example

Year	Unsmoothed	Smoothed
1994	0.36	0.46
1995	0.81	0.53
1996	0.57	0.60
1997	0.67	0.67
1998	0.64	0.74
1999	0.91	0.79
2000	0.93	0.83
2001	0.87	0.86
2002	1.05	0.87
2003	1.00	0.87
2004	0.67	0.87
2005	0.92	0.88
2006	0.87	0.89
2007	1.24	0.91
2008	0.84	0.93
2009	1.10	0.96
2010	1.00	1.00

Term	Change
5YR	10.51
10YR	21.56
ALL YR	83.57

Further information on population indexing and trend analysis can be found in various references; for particular reference to waterbirds see Leech et al (2002) and Atkinson et al. (2006). For information on the UK WeBS Alerts system, please see Thaxter et al. (2010) and Cook et al. (2013).

Limitations

The months chosen for the calculation of population indices aim to reflect the months when the populations at a site are the most stable, excluding months when there may be fluctuations due to passage populations. Despite this, some datasets still present a high degree of variability or fluctuation both within and between years. Because of this, we assess each species separately and take into account where a species shows a history of wide fluctuations between years (within national dataset), or where a species naturally exhibits within-season fluctuations (e.g. species considered to have weak site faithfulness). Where necessary the results of the trend analysis are assigned necessary caution.

A high proportion of imputed counts can limit the effectiveness of the analysis to aid in the interpretation of the dataset. Species for which 50% or more of the monthly count values are imputed are excluded from analysis. But sometimes the calculation of population change may involve a comparison between winters where, at least one has a value based on a high proportion of imputed data. Where data for adjacent winters are relatively complete this is not a serious concern because of the smoothing technique used. However, where data for a number of consecutive winters rely heavily on imputed data then the resulting result is considered less reliable (Thaxter et al. 2010). Where necessary the results of the trend analysis are assigned necessary caution.

Despite the smoothing effects of the GAM analysis, interpretation of population trends may sometimes still be difficult. Therefore we calculate proportional change in the population across differing time periods (e.g. 12-year, 10-year and 5-year periods) to assess more effectively how the population has fared over time.

APPENDIX 4

Waterbird species codes

AE	Arctic Tern	<i>Sterna paradisaea</i>
BY	Barnacle Goose	<i>Branta leucopsis</i>
BA	Bar-tailed Godwit	<i>Limosa lapponica</i>
BE	Bean Goose	<i>Anser fabalis</i>
BS	Bewick's Swan	<i>Cygnus columbianus</i>
AS	Black Swan	<i>Cygnus atratus</i>
BH	Black-headed Gull	<i>Chroicocephalus ridibundus</i>
BN	Black-necked Grebe	<i>Podiceps nigricollis</i>
BW	Black-tailed Godwit	<i>Limosa limosa</i>
BV	Black-throated Diver	<i>Gavia arctica</i>
BG	Brent Goose	<i>Branta bernicla</i>
CG	Canada Goose	<i>Branta canadensis</i>
CM	Common Gull	<i>Larus canus</i>
CS	Common Sandpiper	<i>Actitis hypoleucos</i>
CX	Common Scoter	<i>Melanitta nigra</i>
CN	Common Tern	<i>Sterna hirundo</i>
CO	Coot	<i>Fulica atra</i>
CA	Cormorant	<i>Phalacrocorax carbo</i>
CU	Curlew	<i>Numenius arquata</i>
CV	Curlew Sandpiper	<i>Calidris ferruginea</i>
DN	Dunlin	<i>Calidris alpina</i>
GA	Gadwall	<i>Anas strepera</i>
GP	Golden Plover	<i>Pluvialis apricaria</i>
GN	Goldeneye	<i>Bucephala clangula</i>
GD	Goosander	<i>Mergus merganser</i>
GB	Great Black-backed Gull	<i>Larus marinus</i>
GG	Great Crested Grebe	<i>Podiceps cristatus</i>
ND	Great Northern Diver	<i>Gavia immer</i>
NW	Greenland White-fronted Goose	<i>Anser albifrons flavirostris</i>
GK	Greenshank	<i>Tringa nebularia</i>
H.	Grey Heron	<i>Ardea cinerea</i>
GV	Grey Plover	<i>Pluvialis squatarola</i>
GJ	Greylag Goose	<i>Anser anser</i>
HG	Herring Gull	<i>Larus argentatus</i>
JS	Jack Snipe	<i>Lymnocyptes minimus</i>
KF	Kingfisher	<i>Alcedo atthis</i>
KN	Knot	<i>Calidris canutus</i>
L.	Lapwing	<i>Vanellus vanellus</i>
LB	Lesser Black-backed Gull	<i>Larus fuscus</i>
PB	Light-bellied Brent Goose	<i>Branta bernicla hrotra</i>
ET	Little Egret	<i>Egretta garzetta</i>

LG	Little Grebe	<i>Tachybaptus ruficollis</i>
AF	Little Tern	<i>Sterna albifrons</i>
MA	Mallard	<i>Anas platyrhynchos</i>
MU	Mediterranean Gull	<i>Larus melanocephalus</i>
MH	Moorhen	<i>Gallinula chloropus</i>
MS	Mute Swan	<i>Cygnus olor</i>
OC	Oystercatcher	<i>Haematopus ostralegus</i>
PG	Pink-footed Goose	<i>Anser brachyrhynchus</i>
PT	Pintail	<i>Anas acuta</i>
PO	Pochard	<i>Aythya ferina</i>
PS	Purple Sandpiper	<i>Calidris maritima</i>
RM	Red-breasted Merganser	<i>Mergus serrator</i>
RH	Red-throated Diver	<i>Gavia stellata</i>
RK	Redshank	<i>Tringa totanus</i>
RP	Ringed Plover	<i>Charadrius hiaticula</i>
RU	Ruff	<i>Philomachus pugnax</i>
SS	Sanderling	<i>Calidris alba</i>
TE	Sandwich Tern	<i>Sterna sandvicensis</i>
SP	Scaup	<i>Aythya marila</i>
SU	Shelduck	<i>Tadorna tadorna</i>
SV	Shoveler	<i>Anas clypeata</i>
SY	Smew	<i>Mergus albellus</i>
SN	Snipe	<i>Gallinago gallinago</i>
NB	Spoonbill	<i>Platalea leucorodia</i>
DR	Spotted Redshank	<i>Tringa erythropus</i>
T.	Teal	<i>Anas crecca</i>
TU	Tufted Duck	<i>Aythya fuligula</i>
TT	Turnstone	<i>Arenaria interpres</i>
WA	Water Rail	<i>Rallus aquaticus</i>
WM	Whimbrel	<i>Numenius phaeopus</i>
WG	White-fronted Goose	<i>Anser albifrons</i>
WS	Whooper Swan	<i>Cygnus Cygnus</i>
WN	Wigeon	<i>Anas penelope</i>
WK	Woodcock	<i>Scolopax rusticola</i>

APPENDIX 5

Waterbird foraging guilds (after Weller, 1999)

Guild	Foods	Tactics	Examples...
(1) Surface swimmer	Invertebrates, vegetation & seeds	Strain/sieve/sweep/dabble/grab/up-ending	'Dabbling ducks'; e.g. Shoveler, Teal, Mallard, Pintail, Wigeon, Gadwall
(2) Water column diver – shallow ^a	Fish & Invertebrates;	Search/grab	'Diving ducks' e.g. Pochard, Tufted Duck, Scaup, Eider,
(3) Water column diver – greater depths	Fish & Invertebrates	Search/grab	Common Scoter, divers, grebes, Cormorant
(4) Intertidal walker, out of water	Invertebrates	Search (probe)/grab	Sandpipers, plovers
(5) Intertidal walker, out of water	Invertebrates, vegetation	Sieve/grab/graze	Shelduck, Avocet, Spoonbill, Wigeon, Light-Bellied Brent Goose,
(6) Intertidal walker, in water	Fish	Search/strike	Grey Heron
	Fish, Invertebrates	Probe, scythe, sweep/grab	Spoonbill, Greenshank
	Fish	Stalk	Little Egret
	Invertebrates	Probe	Several sandpiper species
(7) Terrestrial, walker (e.g. grassland/marsh)	Vegetation (inc. roots, tubers & seeds)	Graze, peck, probe	Many geese species

^a dives <3m.

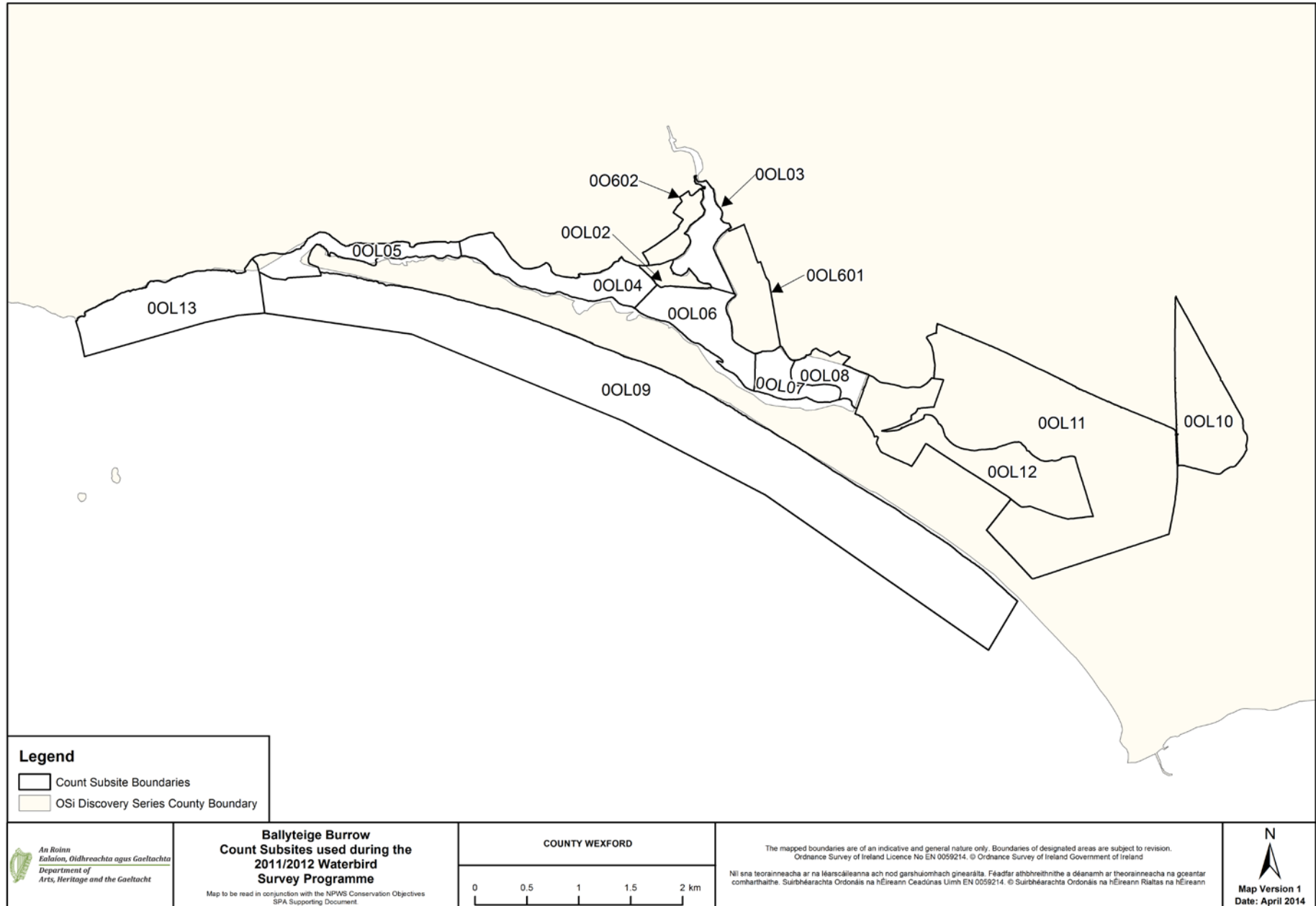
Please note that this table refers to generalised foraging strategies and is meant as a guide only. There is a great deal of variation between sites, seasons, tidal states and indeed, individual birds themselves. For example, some waterbird species may deploy several of the methods, e.g. Shelduck may forage by sieving intertidal mud (5) or by up-ending (1) and Pintail, although generally known as a 'dabbling' duck, does occasionally dive for food.

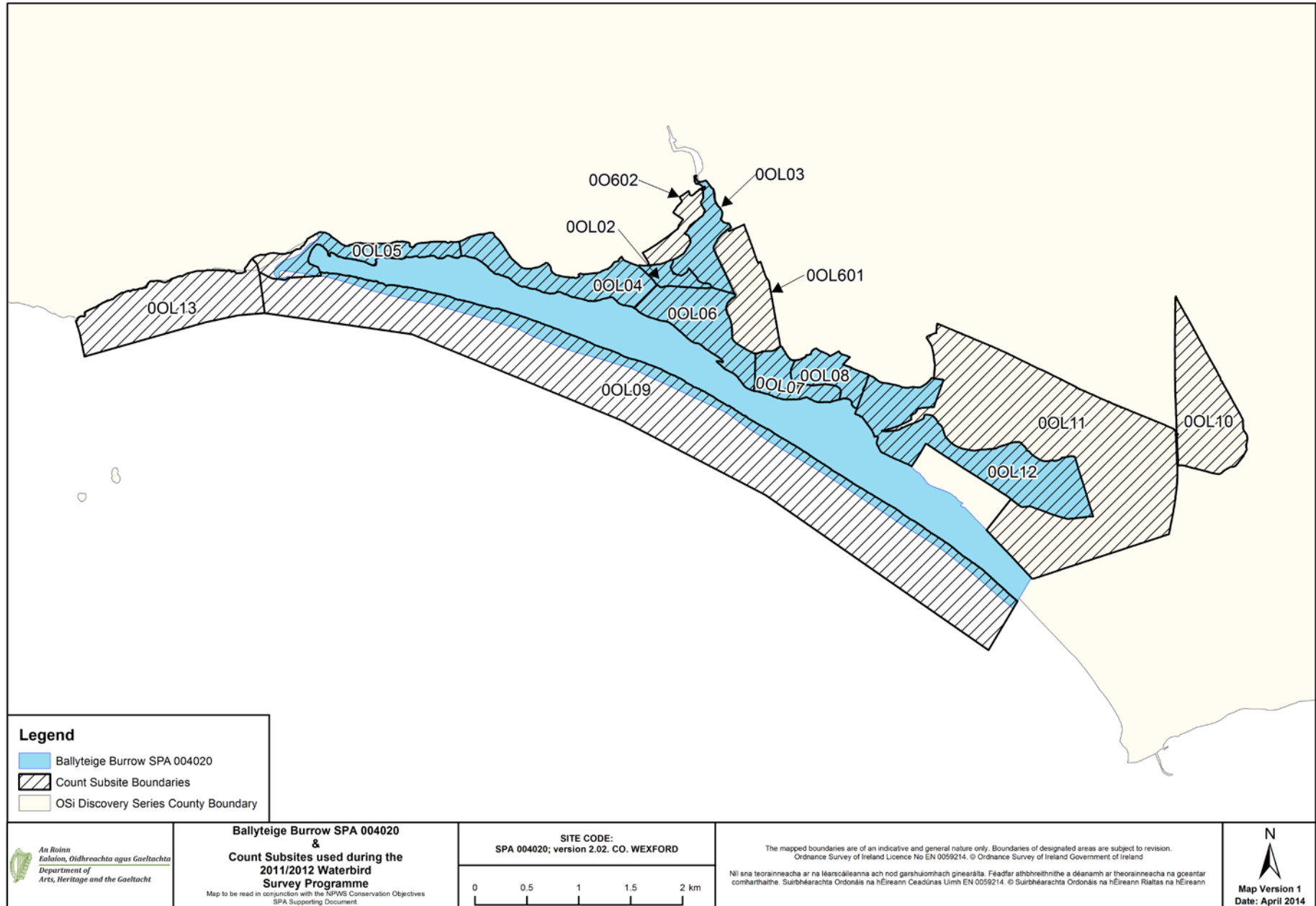
APPENDIX 6

Ballyteige Burrow – Waterbird Survey Programme 2011/12 – Count Subsites

Subsite Code	Subsite Name	Area (ha)
00601	Blackstone fields & racetrack	45.6
00602	Duncormick Hill	16.0
00L02	Duncormick Marsh	8.8
00L03	Seafield	27.8
00L04	Lacken	48.3
00L05	Cullenstown	35.0
00L06	Blackstone	48.9
00L07	Cull Island	22.1
00L08	The Cull	21.8
00L09	Ballyteige	435.6
00L10	Ballyharty Fields	69.7
00L11	Killag Fields	294.6
00L12	Inish & Ballyteige Slob	103.6
00L13	Ballymadder beach	85.0
	Total	1262.8

Survey Dates	
LT1	11.10.11
LT2	12.11.11
LT3	09.12.11
LT4	08.02.12
HT1	16.01.12



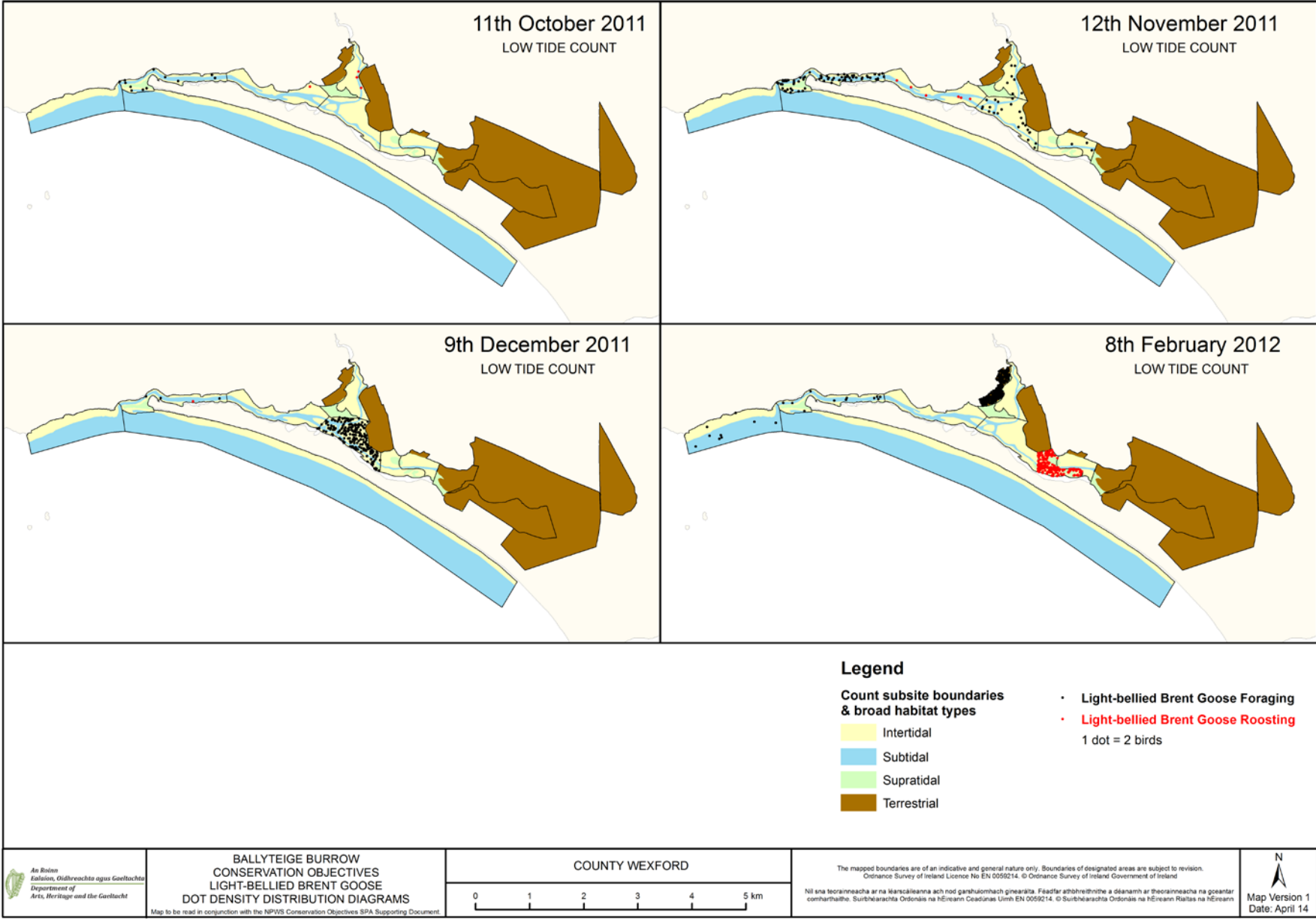


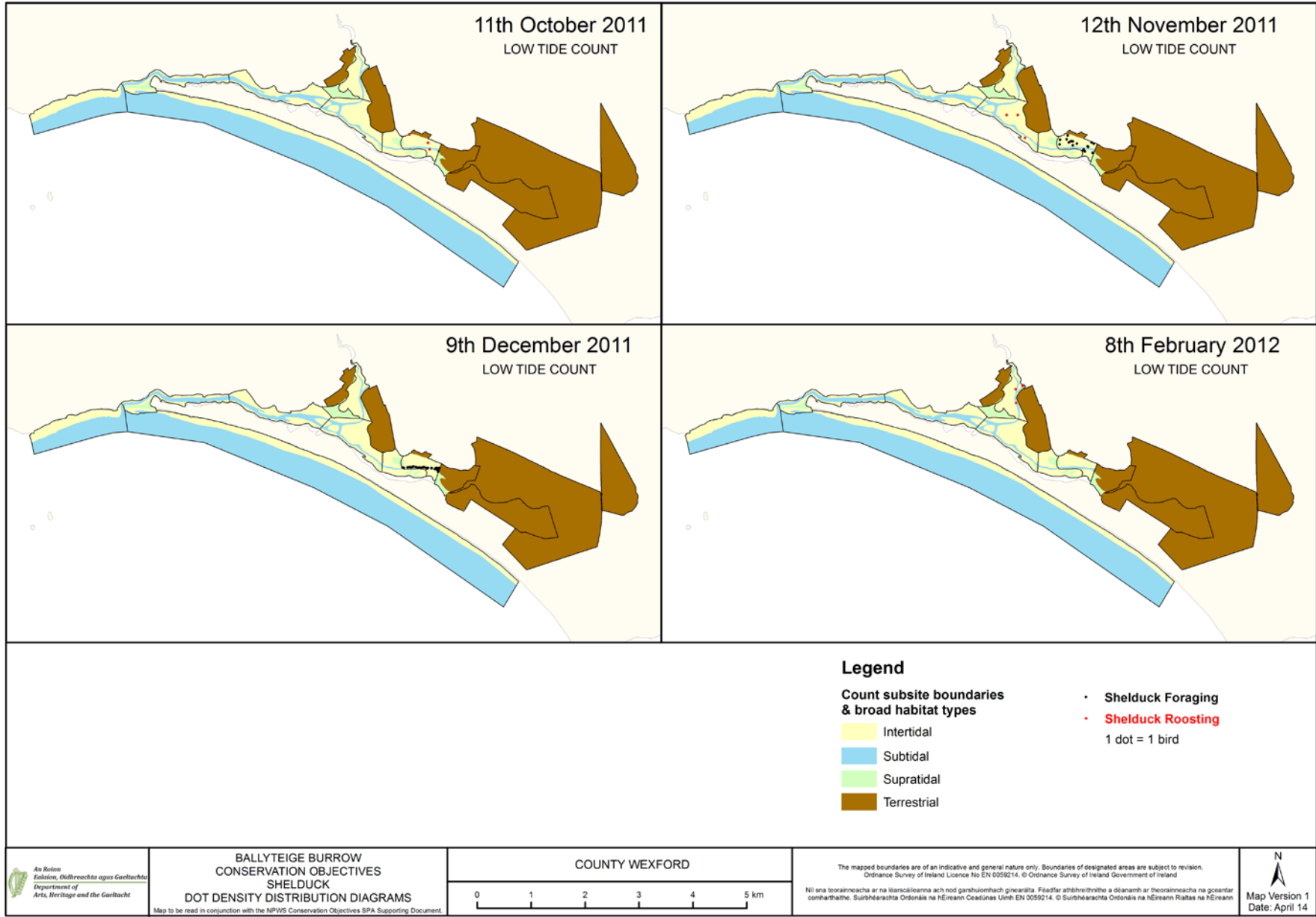
APPENDIX 7

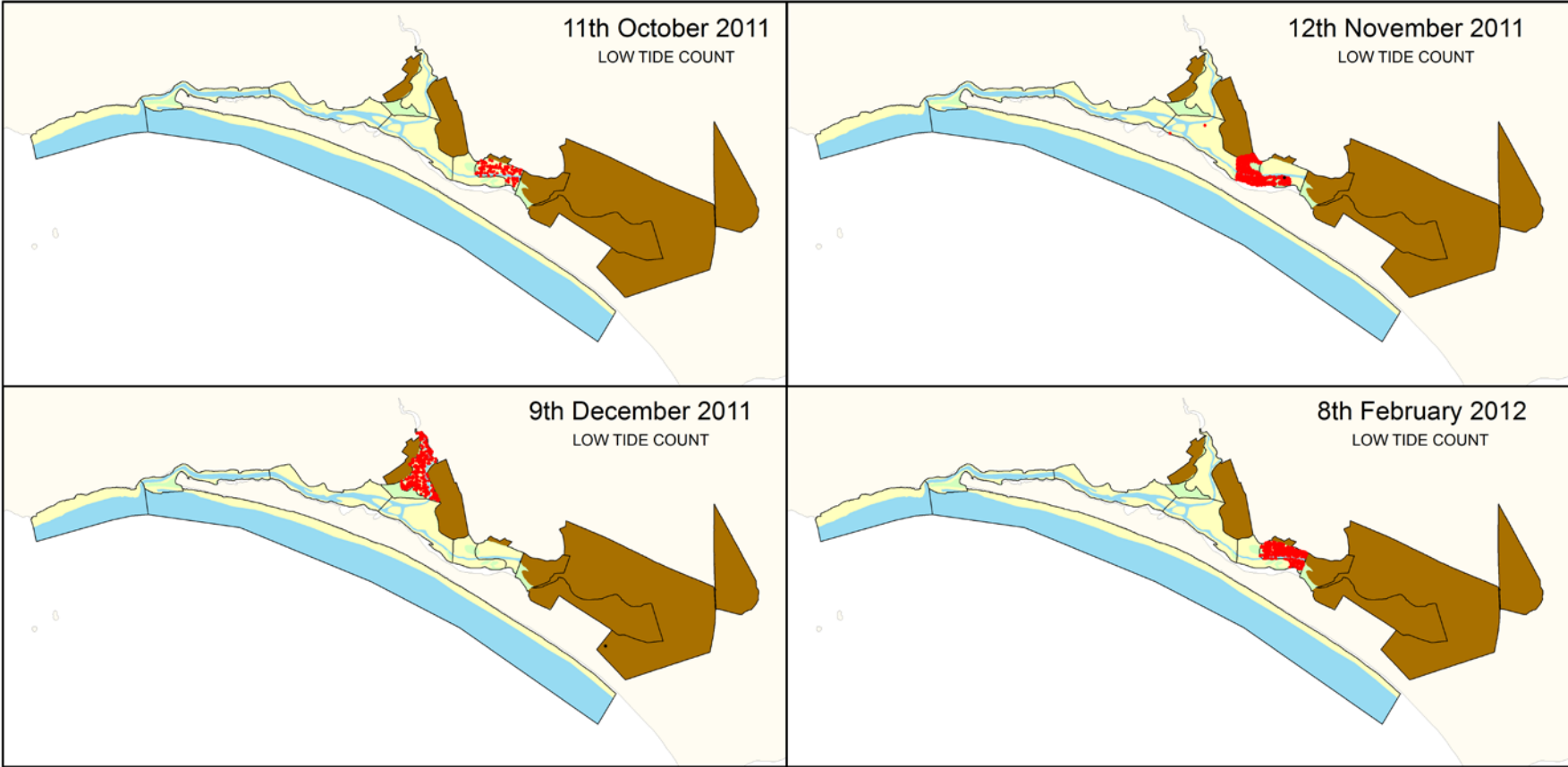
Ballyteige Burrow

Waterbird distribution (dot-density diagrams) recorded during low tide surveys
(October 2011, November 2011, December 2011 & February 2012)

(NB data are presented for birds located in intertidal, subtidal and terrestrial habitats)





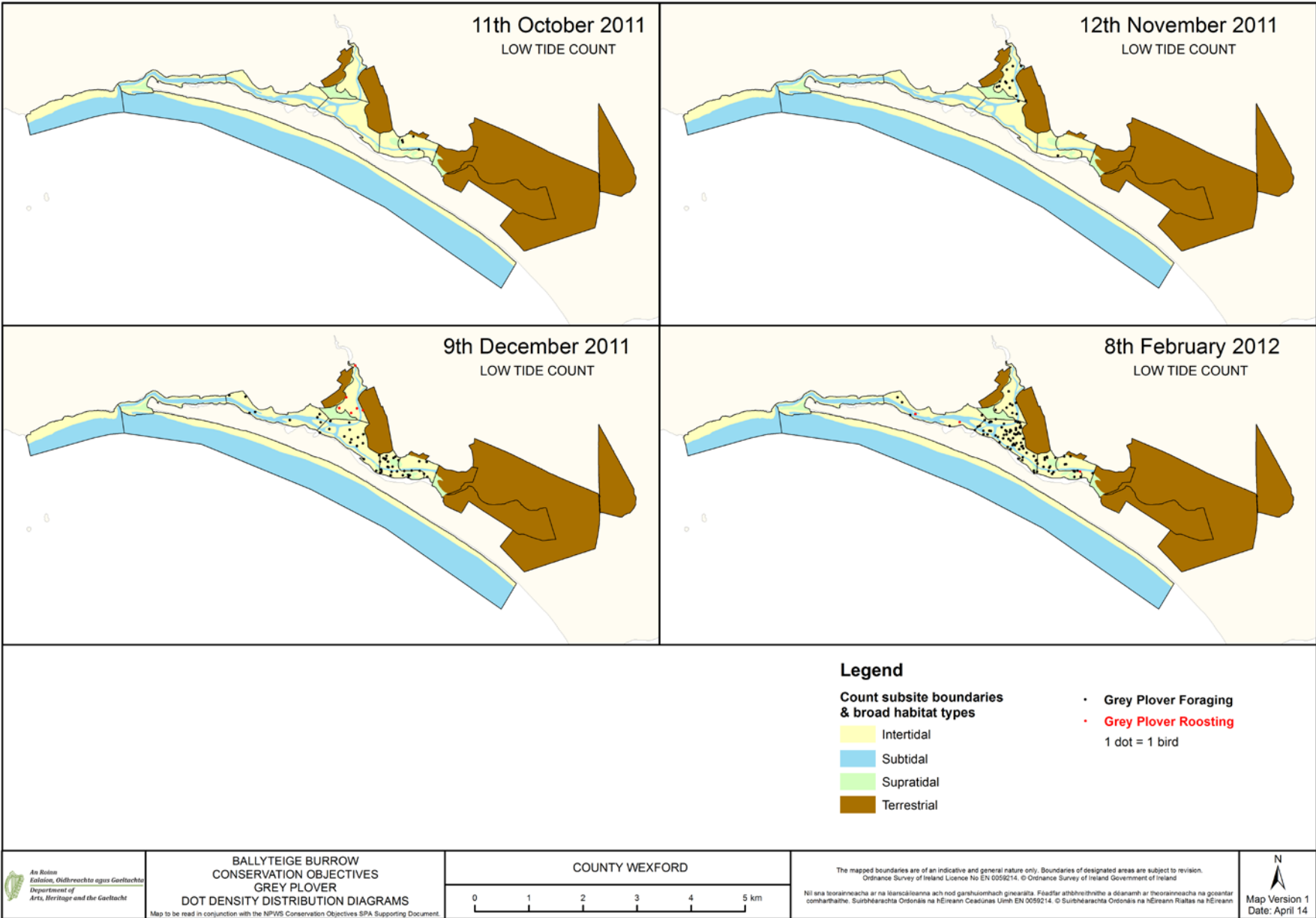


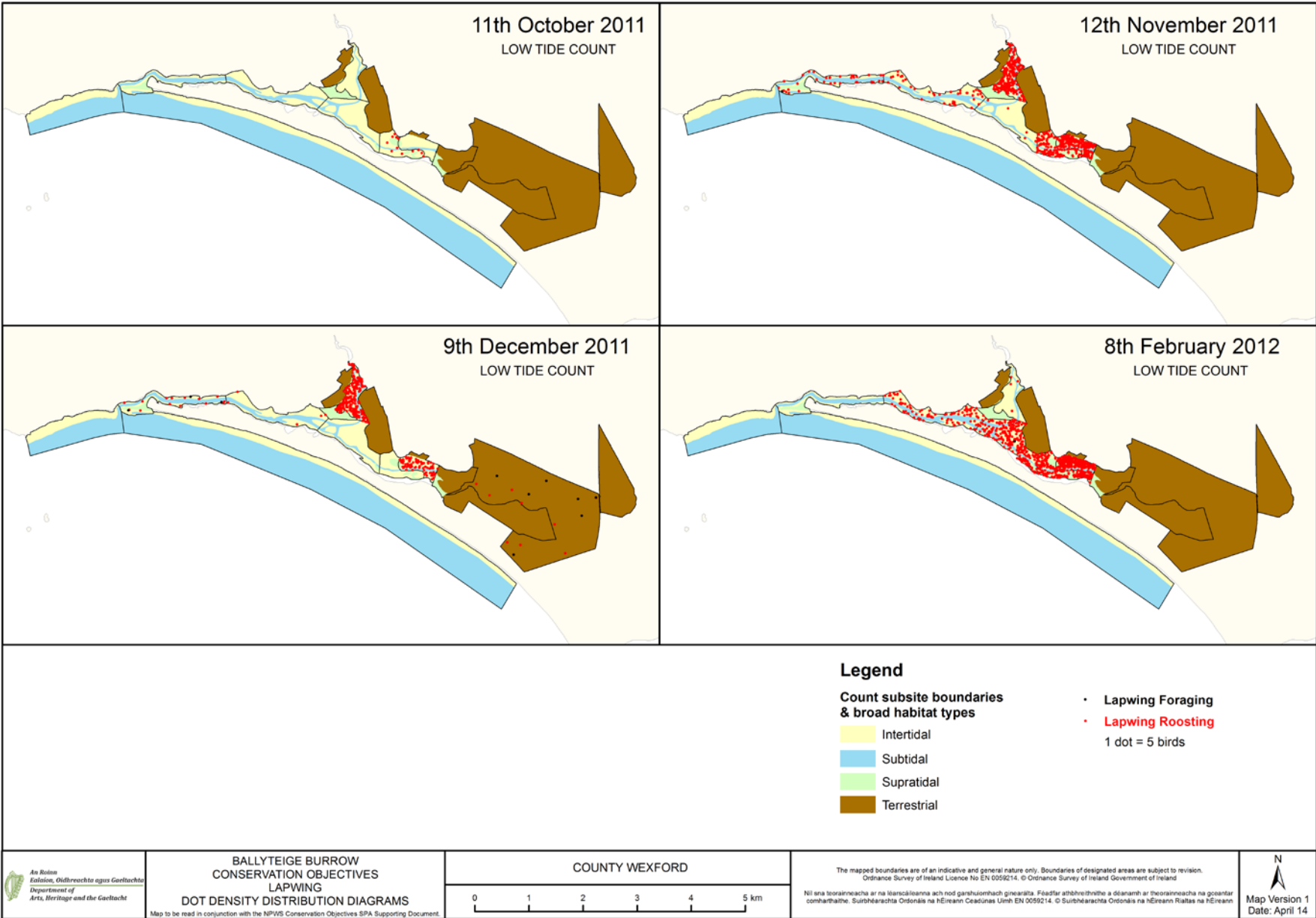
Legend

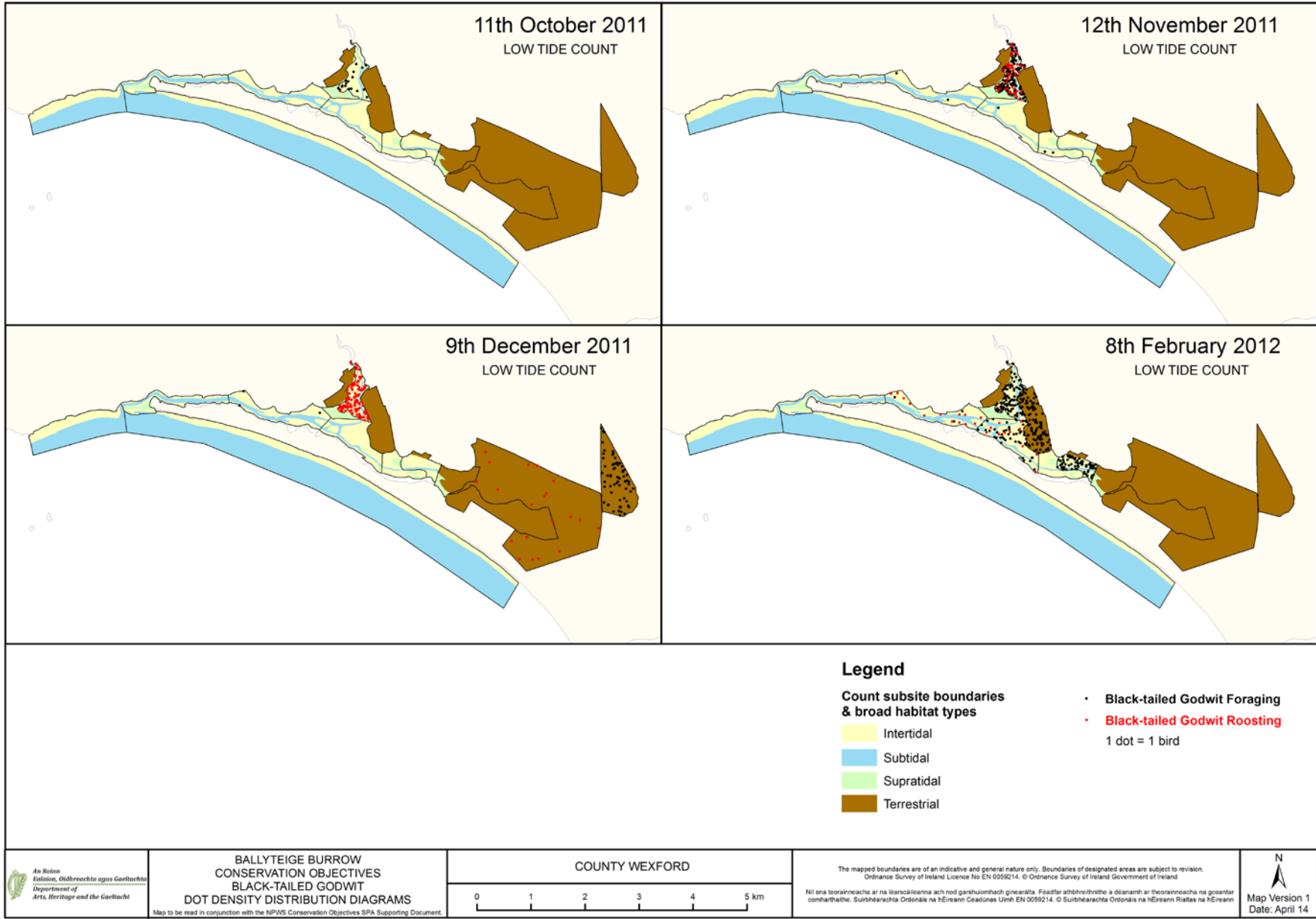
Count subsite boundaries & broad habitat types

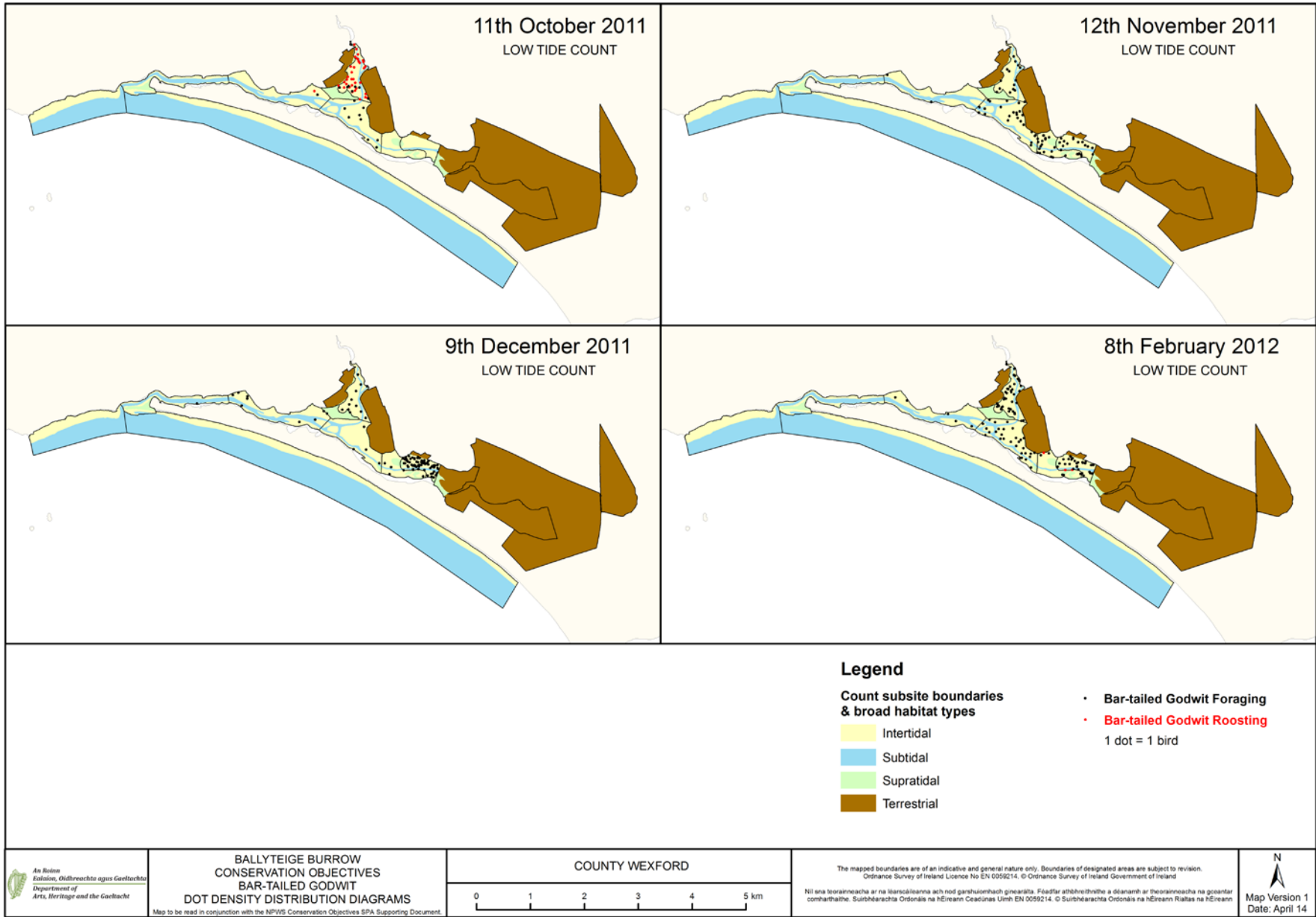
- Intertidal
- Subtidal
- Supratidal
- Terrestrial

- Golden Plover Foraging
- Golden Plover Roosting
- 1 dot = 10 birds









APPENDIX 8

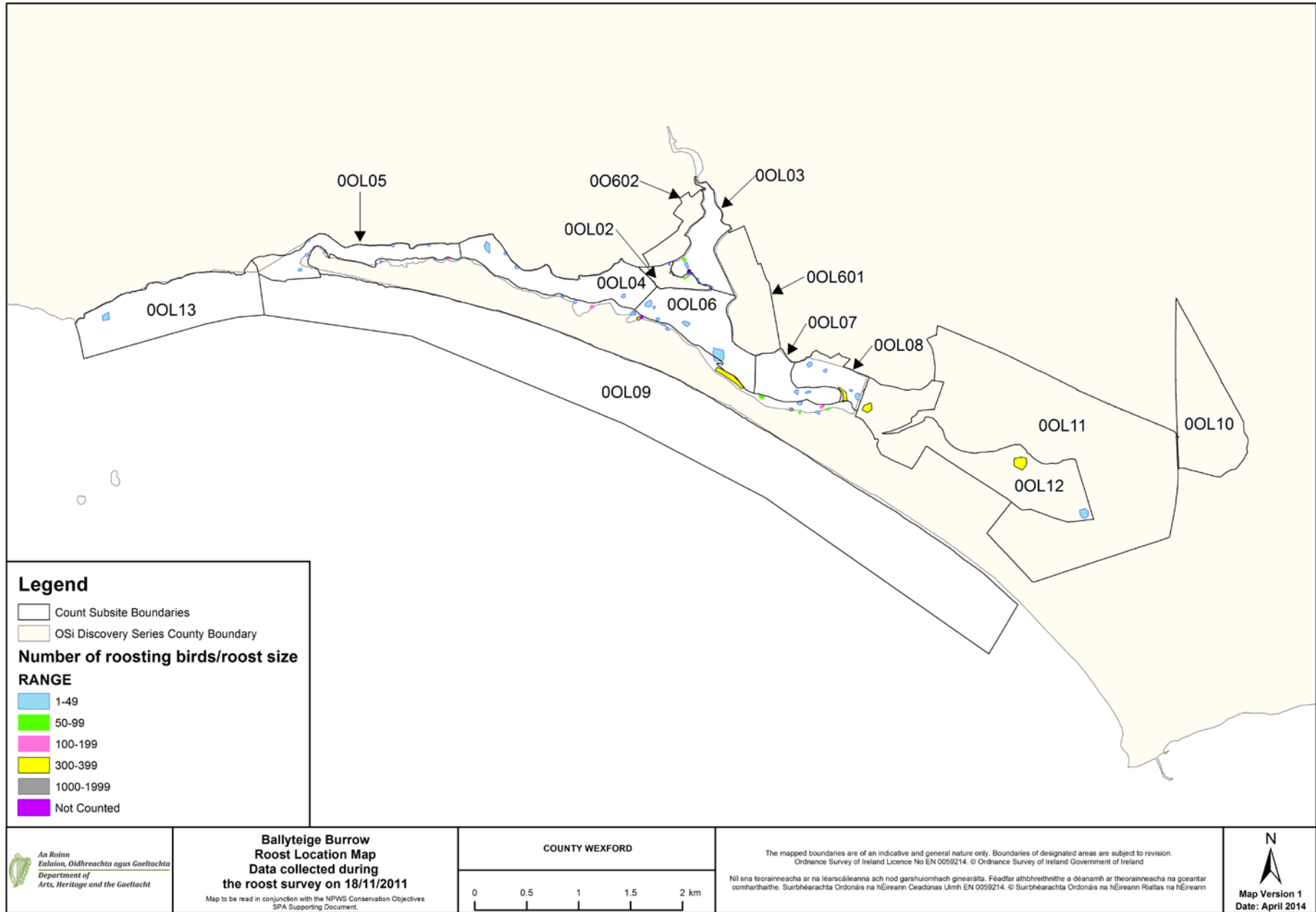
Ballyteige Burrow

(1a) Summary data and roost location maps from the roost survey 18th November 2011 (Please see Sections 5.3.1 and 5.3.2 for further details on methods/limitations)

Subsite Code	Subsite Name	No. roost locations	No. species	Species
0O601	Blackstone fields & racetrack	-	-	
0O602	Duncormick Hill	-	-	
0OL02	Duncormick Marsh	7	13	BA, BH, CM, CU, DN, ET, GP, GB, GV, HG, L., LB, RK.
0OL03	Seafield	7	12	BH, CM, DN, GP, GB, GK, GV, HG, L., LB, OC, RK
0OL04	Lacken	7	10	BH, CM, GB, HG, L., LB, MA, OC, RM, RK
0OL05	Cullenstown	11	11	BH, CM, CU, DN, ET, H., HG, L. OC, RK, TT
0OL06	Blackstone	12	11	BA, BH, CA, DN, GB, GV, HG, L., MA, RM, RK
0OL07	Cull Island	9	12	DN, ET, GP, L., LB, MA, PB, PT, RK, SU, T., WN
0OL08	The Cull	5	7	BH, CA, CM, CU, DN, L., RK
0OL09	Ballyteige	-	-	
0OL10	Ballyharty Fields	-	-	
0OL11	Killag Fields	-	-	
0OL12	Inish & Ballyteige Slob	3	5	GK, GP, H., L., RK
0OL13	Ballymadder Beach	1	1	HG

(1b) Ballyteige Burrow SPA (4020) SCI species and recorded roosts 18/11/11 – shows number of roost locations within subsite, and in brackets, the peak number recorded at a single roost location

Subsite Code	PB	SU	GP	GV	L.	BW	BA
0O601						<i>Not recorded</i>	
0O602							
0OL02			1(1,243)	1 (58)	1 (190)		1 (19)
0OL03			1 (8)	2 (58)	1 (12)		
0OL04					1 (16)		
0OL05					2 (104)		
0OL06				1 (16)	3 (310)		1 (195)
0OL07	1 (3)	1 (45)	1 (75)		1 (1,532)		
0OL08					1 (277)		
0OL09							
0OL10							
0OL11							
0OL12			2 (80)		2 (325)		
0OL13							

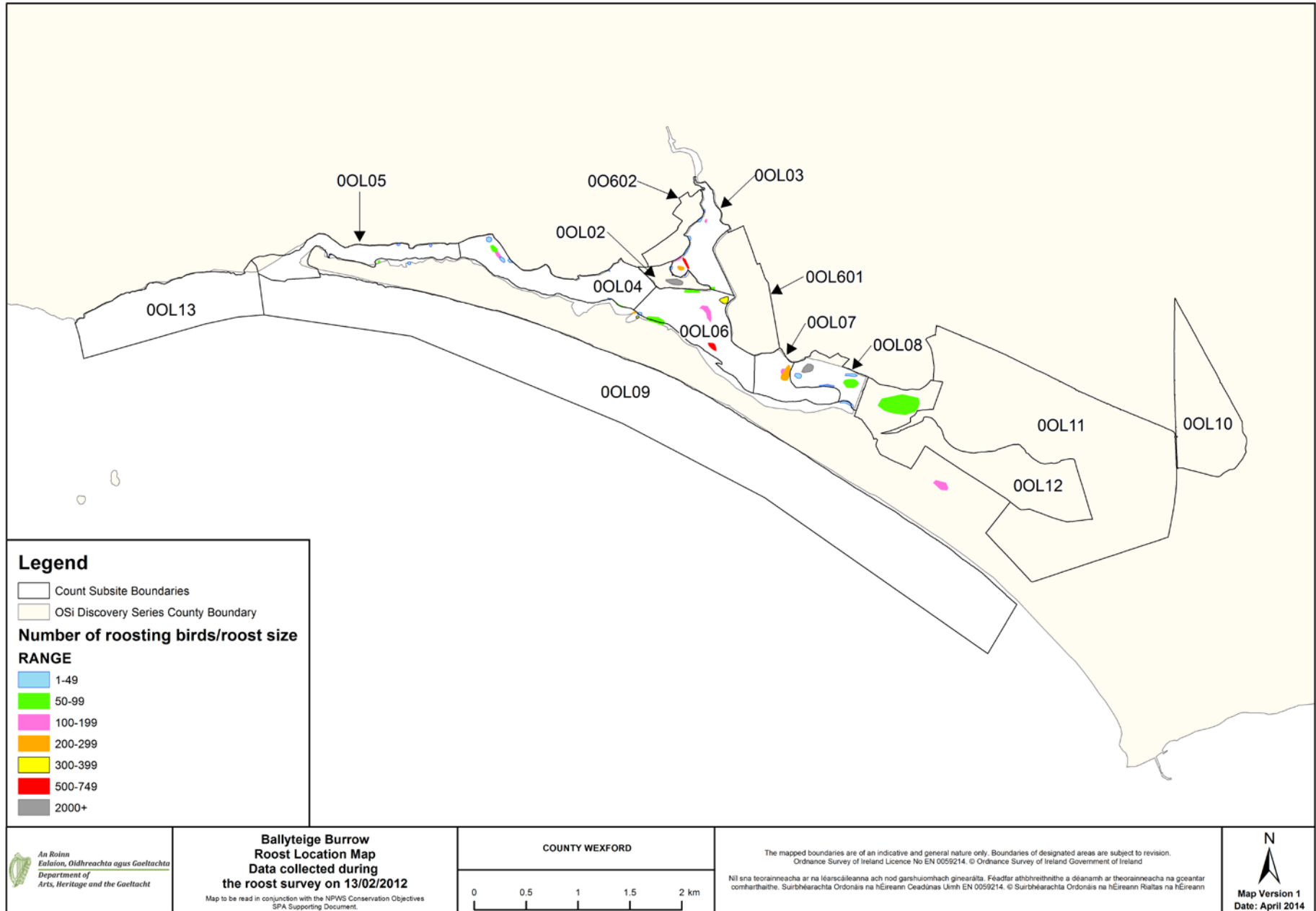


(2a) Summary data and roost location maps from the roost survey 13th February 2012
 (Please see Sections 5.3.1 and 5.3.2 for further details on methods/limitations)

Subsite Code	Subsite Name	No. roost locations	No. species	Species
00601	Blackstone fields & racetrack	-	-	
00602	Duncormick Hill	-	-	
00L02	Duncormick Marsh	1	1	L.
00L03	Seafield	11	13	BA, BH, BW, CM, CU, DN, GK, GV, L., OC, PB, RK, T.
00L04	Lacken	8	11	BW, CA, CU, GB, GK, HG, L., OC, PB, RK, WN
00L05	Cullenstown	5	5	CU, GB, GK, RK, WN
00L06	Blackstone	8	14	BA, BH, BW, CA, CM, CU, DN, GB, GV, HG, L., OC, PB, RK
00L07	Cull Island	2	6	CU, DN, GV, L., OC, WN
00L08	The Cull	6	9	BH, CU, DN, GK, L., LD, MA, RK, WN
00L09	Ballyteige	-	-	
00L10	Ballyharty Fields	-	-	
00L11	Killag Fields	-	-	
00L12	Inish & Ballyteige Slob	2	4	BH, ET, L., SU
00L13	Ballymadder Beach	-	-	

(2b) Ballyteige Burrow SPA (4020) SCI species and recorded roosts 13/02/12 – shows number of roost locations within subsite, and in brackets, the peak number recorded at a single roost location

Subsite Code	PB	SU	GP	GV	L.	BW	BA
00601							
00602							
00L02					1 (2,800)		
00L03	1 (249)			1 (2)	2 (156)	2 (150)	
00L04	1 (20)				1 (186)	1 (64)	
00L05							
00L06	1 (300)		1 (2)	1 (2)	3 (533)	2 (62)	3 (27)
00L07				1 (2)	1 (200)		
00L08					1 (2,000)		
00L09							
00L10							
00L11							
00L12		1 (3)			1 (65)		
00L13							



APPENDIX 9

Ballyteige Burrow - Activities & Events

Please note that this list is based on the current review process and is not exhaustive.

Legend:	
O	<u>o</u> bserved or known to occur in or around Ballyteige Burrow.
U	known to occur but <u>u</u> nknown area (subsites)/spatial extent; hence all potential subsites are included (e.g. fisheries activities).
H	<u>h</u> istoric, known to have occurred in the past.
P	<u>p</u> otential to occur in the future.
	Grey highlighting refers to activities that have the potential to cause disturbance to waterbirds.

Activity/Event	00601	00602	00L02	00L03	00L04	00L05	00L06	00L07	00L08	00L09	00L10	00L11	00L12	00L13
1. Coastal protection, sea defences & stabilisation														
1.1 Linear defences			○	○	○	○	○	○	○					
1.3 Groynes						○								
1.4 <i>Spartina</i> planted/growing							○	○	○					
1.5 Marram grass			○	○	○					○				
2. Barrage schemes/drainage														
2.1 Weirs and barrages for river management									○			○	○	
2.2 Altered drainage/river channel									H					
4. Industrial, port & related development														
4.3 Slipway							○	○						
4.8 Other							○							
6. Pollution														
6.1 Domestic & urban waste water					○									
6.4 Agricultural & forestry effluents				H			H	H						
6.7 Solid waste incl. fly-tipping				○			○	○						
7. Sediment extraction (marine & terrestrial)														
7.1 Channel dredging (maintenance & navigation)												○		
7.2 Quarrying													○	
8. Transport & communications														
8.5 Road schemes	○		○	○				○						
8.6 Car parks										○				○
12. Tourism & recreation														
12.2 Non-marina moorings						○								
12.15 Angling			○	○		○	○	○		○				
12.17 Bathing & general beach recreation														○
12.18 Walking, incl. dog walking			○	○	○	○	○	○	○	○	○	○	○	○

Activity/Event	00601	00602	00L02	00L03	00L04	00L05	00L06	00L07	00L08	00L09	00L10	00L11	00L12	00L13
12.19 Birdwatching			O	O			O	O	O	O	O	O	O	
12.22 Motorised vehicles				O	O		O						O	
12.23 Horse-riding					O	O	O	O	O			O	O	
13. Wildfowl & hunting														
13.1 Wildfowling			H	H			H	H					H	
14. Bait-collecting														
14.1 Digging for lugworms/ragworms				O			O							
15. Fisheries & Aquaculture														
15.1 Professional passive fishing (e.g. longlining)										U				U
15.4 Fish traps & other fixed devices & nets										U				U
15.5 Leisure fishing										O				
15.6 Molluscs - hand-gathering						O								
15.9 Intertidal aquaculture e.g. trestles					O	O								
16. Agriculture & forestry														
16.2 Grazing: intensive (terrestrial)			O				O	O			O	O	O	
16.3 Grazing: non-intensive (terrestrial)								O	O	O				
16.4 Sand dune grazing							O	O		O				
16.5 Stock feeding								O				O	O	
16.6 Crop production: intensive				O								O	O	
16.9 Removal of hedges, scrub			H	H			H	H						
16.12 Polderisation							H	H	H			H	H	
16.13 Agricultural land-claim			H											
19. Natural events														
19.1 Storms, floods and storm surges			H	H			H	H		H				
19.2 Severe cold weather	O	O	O	O	O	O	O	O	O	O	O	O	O	O

APPENDIX 10

Disturbance Assessment

Scoring system - definitions & rationale

Frequency/Duration	Score	Rationale
Continuous	3	Continuous motion or noise; not necessarily 24-hours per day but zones of fairly continuous activity such as a port or marina.
Frequent	2	Frequently observed during the survey programme, can be up to several times per 6 hour tidal cycle; and/or known to occur on a frequent basis.
Infrequent	1	Observed only once or twice during the survey programme and known/considered likely to be infrequent.
Rare	0	Known to occur but not observed during the survey programme and considered likely to be rare in occurrence.
Intensity	Score	Rationale
Active, high-level	3	Would indicate an active event that is likely to displace waterbirds during its presence e.g. active shipping channel, speed boats, quad bikes, loose dogs.
Medium-level	2	Lower intensity events such as non-powered watercraft, vehicles, people walking along a shoreline (without dogs) – that are likely to result in waterbirds moving but birds will be less 'alarmed' than (1) and response will be species-specific.
Low-level	1	Although activity may be of a nature to displace waterbirds, birds move only slightly, resume normal behaviour quickly or show no determinable response at all; e.g. solitary walkers close to site but not impacting on waterbirds' immediate location; cars passing on an adjacent road...
Very low-level	0	Any activities considered to impart little effect upon waterbirds.
Response	Score	Rationale
Most birds disturbed all of the time	3	Birds do not return - therefore equivalent to habitat loss.
Most birds displaced for short periods	2	Birds return once disturbance has ceased.
Most species tolerate disturbance	1	Weak response, birds may move slightly away from disturbance source.
Most birds successfully habituate to the disturbance	0	Little determinable effects.

The scores assigned to the three attributes were then added together to give an overall 'disturbance score' which is used to define the extent of the impact as follows:-

Scores 0 – 3 = **Low**
 Scores 4 – 6 = **Moderate**
 Scores 7 – 9 = **High**

Scoring system – worked example

Disturbance event – humans walking along a beach; the beach is a popular recreational area and this activity was recorded frequently during surveys.		
Attribute	Score	Rationale
Frequency/Duration	2	Recorded frequently during the survey period; known area of beach recreation.
Intensity	2	Medium level - considered likely to result in waterbirds moving away from the source of disturbance although response will be species-specific and some species may even habituate to the activity.
Response	2	Most birds are displaced for short periods and therefore will resume their previous behaviour in the area when the activity ceases.
TOTAL SCORE	6	MODERATE

Results - based on records from the 2011/12 Waterbird Survey Programme

Activity/Event	00L03	00L04	00L05	00L06	00L07	00L11	00L13
12. Tourism & recreation							
12.18 Walking, incl. dog walking	3	6	6		6	5	5
12.22 Motorised vehicles	5			5			
12.23 Horse-riding		4			4	5	
14. Bait-collecting							
14.1 Digging for lugworms/ragworms				4			
15. Fisheries & Aquaculture							
15.6 Molluscs - hand-gathering			4				
15.9 Intertidal aquaculture e.g. trestles		5	5				